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UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA

ILLUMINA, INC. and
ILLUMINA CAMBRIDGE LTD.,

Plaintiffs,

v.

BGI GENOMICS CO., LTD.,
 BGI AMERICAS CORP,
 MGI TECH CO., LTD.,
 MGI AMERICAS INC., and
 COMPLETE GENOMICS INC.,

Defendants.

Case No.: 19-cv-03770-WHO

DEFENDANTS' FIRST AMENDED
ANSWER TO ILLUMINA'S FIRST
AMENDED COMPLAINT FOR PATENT
INFRINGEMENT AND
COUNTERCLAIM FOR PATENT
INFRINGEMENT

DEMAND FOR JURY TRIAL

Defendants¹ BGI Americas Corp. (“BGI Americas”), MGI Tech Co., Ltd. (“MGI Tech”), MGI Americas Inc. (“MGI Americas”), and Complete Genomics, Inc. (“CGI”) (collectively, “Defendants”),² through their undersigned counsel, hereby demand a jury trial and answers Plaintiffs Illumina, Inc. and Illumina Cambridge Ltd.’s (collectively, “Illumina” or “Plaintiffs”) First Amended Complaint, D.N. 52, (the “First Amended Complaint”) as follows:

INTRODUCTION

1. Defendants admit that BGI Genomics and MGI Tech are headquartered in Shenzhen, China. Defendants deny any remaining allegations of Paragraph 1 of the First Amended Complaint.

2. Defendants admit that a preliminary injunction was granted in *Illumina, Inc. v. Qiagen, NV*, 207 F. Supp.3d 1081 (N.D. Cal. 2016). Defendants further admit that certain claims of the ’537 Patent were not invalidated in *Intelligent Bio-Systems v. Illumina Cambridge*, 821 F.3d 1359 (Fed. Cir. 2016). Defendants deny any remaining allegations of Paragraph 2 of the First Amended Complaint.

3. Defendants admit that CGI filed two Petitions to institute *inter partes* review (“IPR”) of several claims of the ’537 Patent and that neither Petition was instituted. *Complete Genomics, Inc. v. Illumina Cambridge Ltd.*, IPR2017-02172, Paper 20 (PTAB Apr. 20, 2018) and IPR2017-02174, Paper 20 (PTAB Apr. 20, 2018). Defendants admit that CGI listed BGI Shenzhen Co., Ltd.; BGI Groups USA Inc.; BGI Genomics Co., Ltd.; and BGI Americas Corporation as real parties in interest in those Petitions and that MGI Tech and MGI Americas were not identified as real parties in interest. Defendants deny any remaining allegations of Paragraph 3 of the First Amended Complaint.

¹ At the time of this filing, Defendant BGI Genomics, Co. Ltd. (“BGI Genomics”) has not been served with Illumina’s Complaint or Amended Complaint. Nothing herein shall be considered a response by BGI Genomics. With respect to any response contained herein that is directed to alleged activities or knowledge of BGI Genomics, such response is based on the information and belief of the responding Defendants only.

² Illumina refers to the Defendants with alternative short-hand names that are inconsistent with ordinary corporate practice. Thus, those short-hand names are not used herein.

6. Paragraph 6 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 6 of the First Amended Complaint.

7. Defendants admit that, on information and belief, Plaintiff Illumina, Inc. is a Delaware corporation with its principal place of business at 5200 Illumina Way, San Diego, California 92122.

9. Defendants lack sufficient information to admit or deny the allegations of Paragraph 9 of the First Amended Complaint, and on that basis, deny them.

11. Defendants deny the allegations of Paragraph 11 of the First Amended Complaint.

12. Defendants admit that MGI Tech is a Chinese corporation that has its headquarters at Building No.11, Beishan Industrial Zone, Yantian District, Shenzhen 518083, China.

Defendants deny any remaining allegations of Paragraph 12 of the First Amended Complaint.

13. Defendants admit that MGI Americas has a principal place of business at 2904 Orchard Parkway, San Jose, California 95134. Defendants deny any remaining allegations of Paragraph 13 of the First Amended Complaint.

14. Defendants admit that CGI has a principal place of business at 2904 Orchard Parkway, San Jose, California 95134. Defendants deny any remaining allegations of Paragraph 14 of the First Amended Complaint.

15. Paragraph 15 contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 15 of the First Amended Complaint.

JURISDICTION AND VENUE

16. Defendants admit that this action arises under the Patent Laws of the United States of America and that this Court has federal question jurisdiction.

17. Defendants admit that, for the purposes of this action, venue is proper in this District. Defendants further admit that MGI Americas and CGI have a principal place of business at 2904 Orchard Parkway, San Jose, California 95134. Defendants deny any remaining allegations of Paragraph 17 of the First Amended Complaint.

18. Defendants admit that venue is proper in this District for the foreign Defendants. Defendants admit that Judge Alsup of this District had experience with the Plaintiffs' asserted patents, but he has stated that he "now remembers little about the patents." *See* D.N. 18. Defendants deny any remaining allegations of Paragraph 18 of the First Amended Complaint.

19. Paragraph 19 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that, for the purposes of this action, Defendants do not contest personal jurisdiction. Defendants deny any remaining allegations of Paragraph 19 of the First Amended Complaint.

1 20. Paragraph 20 of the First Amended Complaint contains legal conclusions to which
 2 no response is required. To the extent that a response is deemed required, Defendants deny the
 3 allegations of Paragraph 20 of the First Amended Complaint.

4 a. Defendants admit that Ex. 5 of the First Amended Complaint depicts

5 “Representative Offices” in San Francisco, Los Angeles, and San Diego,
 6 California and an “Office/Lab” in San Jose, California. Defendants deny any
 7 remaining allegations of Paragraph 20.a. of the First Amended Complaint.

8 b. Paragraph 20.b. of the First Amended Complaint contains legal conclusions to
 9 which no response is required. To the extent that a response is deemed required,
 10 Defendants deny the allegations of Paragraph 20.b. of the First Amended
 11 Complaint.

12 c. Paragraph 20.c. of the First Amended Complaint contains legal conclusions to
 13 which no response is required. To the extent that a response is deemed required,
 14 Defendants admit that BGI Genomics has had a presence at industry trade shows
 15 in California, including those listed in Paragraph 20.c. of the First Amended
 16 Complaint and that BGI Genomics’ CEO, Ye Yin, presented at the J.P. Morgan
 17 Health Care Conference in January of 2018. Defendants deny any remaining
 18 allegations in Paragraph 20.c. of the First Amended Complaint.

19 d. Defendants admit that in March 2019, BGI Genomics entered into a \$50 million
 20 partnership with Natera, Inc. Defendants deny any remaining allegations in
 21 Paragraph 20.d. of the First Amended Complaint.

22 21. Paragraph 21 of the First Amended Complaint requires no response.

23 a. Defendants admit that Ex. 12 of the First Amended Complaint identifies Yongwei
 24 Zhang as Group VP and CEO of BGI Americas Region at BGI Group. Defendants
 25 deny any remaining allegations in Paragraph 21.a. of the First Amended
 26 Complaint.

b. Defendants admit that Ex. 13 of the First Amended Complaint identifies Ke Zhan as a Director of Product Management at BGI Americas. Defendants deny any remaining allegations in Paragraph 21.b. of the First Amended Complaint.

c. Defendants admit that Ex. 14 of the First Amended Complaint identifies Yuhan Zhang as a resident in the San Francisco Bay Area and as having worked in San Jose, California. Defendants further admit that Ex. 14 of the First Amended Complaint states that Ms. Zhang “[i]dentified new business opportunities, reached out to potential partners and managed existed relationship through email campaign, framed contracts and MoU,” and “[o]rganized and supported marketing events in North and South America to promote the brand and publicity.”

22. Paragraph 22 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that, for purposes of this case, BGI Genomics has not contested personal jurisdiction, but that BGI has not been served, such that exercise of jurisdiction over BGI Genomics is improper at this time. *See* D.N. 27 and 42. Defendants deny any remaining allegations of Paragraph 22 of the First Amended Complaint.

23. Paragraph 23 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that BGI Americas is present in California. Defendants deny any remaining allegations of Paragraph 23 of the First Amended Complaint.

a. Defendants admit the allegations of Paragraph 23.a. of the First Amended Complaint.

b. Defendants deny the allegations of Paragraph 23.b. of the First Amended Complaint.

c. Paragraph 23.c. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that some employees of BGI Americas, including Johan Christiaanse, are located in this District. Defendants also admit that Yongwei

1 Zhang resides in this District. Defendants deny any remaining allegations of
2 Paragraph 23.c. of the First Amended Complaint.

3 24. Paragraph 24 of the First Amended Complaint contains legal conclusions to which
4 no response is required. To the extent that a response is deemed required, Defendants admit that
5 this Court has jurisdiction over BGI Americas. Defendants deny any remaining allegations of
6 Paragraph 24 of the First Amended Complaint.

7 25. Paragraph 25 of the First Amended Complaint contains legal conclusions to which
8 no response is required. To the extent that a response is deemed required, Defendants deny the
9 allegations of Paragraph 25 of the First Amended Complaint.

10 a. Defendants admit that a map on MGI Tech's website shows a San Jose, California
11 facility that is a "Research Center" and a "Commercial and After-Sales Service
12 Center." Defendants deny any remaining allegations of Paragraph 25.a. of the
13 First Amended Complaint.

14 b. Paragraph 25.b. of the First Amended Complaint contains legal conclusions to
15 which no response is required. To the extent that a response is deemed required,
16 Defendants admit that the MGI Americas' website, as reflected in Ex. 20 to the
17 First Amended Complaint, states: "As the leading manufacturer and developer of
18 BGI's proprietary NGS instrumentation, the global MGI organization provides
19 comprehensive products and services for fully-automated, real-time, whole picture
20 and lifelong genetic analysis in life science research." Defendants admit that NGS
21 stands for "next generation sequencing." Defendants deny any remaining
22 allegations of Paragraph 25.b. of the First Amended Complaint.

23 c. Paragraph 25.c. of the First Amended Complaint contains legal conclusions to
24 which no response is required. To the extent that a response is deemed required,
25 Defendants admit that Duncan Yu presented at the J.P. Morgan Healthcare
26 Conference in San Francisco, California in January of 2019. Defendants deny any
27 remaining allegations of Paragraph 25.c. of the First Amended Complaint.
28

d. Defendants deny the allegations of Paragraph 25.d. of the First Amended Complaint.

e. Paragraph 25.e. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that MGI Tech is involved in the research, development and marketing of the accused products. Defendants deny any remaining allegations of Paragraph 25.e. of the First Amended Complaint.

f. Paragraph 25.f. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that MGI Tech's Chief Scientific Officer, Rade Drmanac, resides in this District. Defendants further admit that Jia Sophie Liu and Paul Lundquist reside in this District. Defendants deny any remaining allegations of Paragraph 25.f. of the First Amended Complaint.

26. Paragraph 26 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, for purposes of this case, Defendants do not contest that this Court has jurisdiction over MGI Tech. Defendants deny any remaining allegations of Paragraph 26 of the First Amended Complaint.

27. Paragraph 27 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that MGI Americas is present in California. Defendants deny any remaining allegations of Paragraph 27 of the First Amended Complaint.

a. Paragraph 27.a. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that the MGI Americas' website, as reflected in Ex. 20 of the First Amended Complaint, states: "As the leading manufacturer and developer of BGI's proprietary NGS instrumentation, the global MGI organization provides comprehensive products and services for fully-automated, real-time, whole picture and lifelong genetic analysis in life science research." Defendants admit that NGS

stands for “next generation sequencing.” Defendants deny any remaining allegations of Paragraph 27.a. of the First Amended Complaint.

b. Paragraph 27.b. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that MGI Americas is involved in the research, development and marketing of the accused products. Defendants deny any remaining allegations of Paragraph 27.b. of the First Amended Complaint.

c. Defendants admit that Ex. 28 of the First Amended Complaint states that MGI Americas’ field service engineer, Abigail Frank, “services NGS instruments and lab automated workstations at Complete Genomics in San Jose, as well as external customers throughout North and South America.” Defendants deny any remaining allegations of Paragraph 27.c. of the First Amended Complaint.

28. Paragraph 28 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, for purposes of this case only, Defendants do not contest that this Court has jurisdiction over MGI Americas. Defendants deny any remaining allegations of Paragraph 28 of the First Amended Complaint.

29. Paragraph 29 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that CGI is present in California. Defendants deny any remaining allegations of Paragraph 29 of the First Amended Complaint.

a. Paragraph 29.a. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that CGI is involved in the research and development of the accused products. Defendants deny any remaining allegations of Paragraph 29.a. of the First Amended Complaint.

b. Paragraph 29.b. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that according to Exs. 25 & 30-31 of the First Amended

1 Complaint, Suzanne Yakota, Shifeng Li, and Rade Drmanac's LinkedIn profiles
2 state they reside in the San Francisco Bay Area. Defendants deny any remaining
3 allegations of Paragraph 29.b. of the First Amended Complaint.

4 c. Defendants admit that, according to Ex. 32 of the First Amended Complaint, CGI
5 Fluidics Systems Engineer, Wei Wang, states she ensures the proper installation
6 qualification and operation qualification (IQ/OQ), and instrument performance
7 verification (IPV) of NGS systems, such as the BGISEQ-500 in an ISO 17025
8 accredited and customer-oriented environment, and that Ms. Wang states she is
9 responsible for creating and compiling comprehensive procedural documentation
10 for NGS systems, for processes including IQ/OQ, IPV, troubleshooting, repairs,
11 replacement parts, calibrations, and maintenance.

12 d. Defendants admit that Exs. 33-34 of the First Amended Complaint describe CGI
13 job postings for a Senior Regional Sales Manager/Director and a Strategic
14 Accounts Specialist/Manager/Director based in San Jose, California. Defendants
15 further admit that, according to the job postings, the positions, inter alia, would: (i)
16 provide a one touch-point for the global customers with the full MGI product
17 portfolio; (ii) navigate orders through the customer purchasing process; and (iii) be
18 responsible for leading regional sale activities for MGI's NGS Sequencing
19 instruments, reagents, software or solutions in the designated region. Defendants
20 deny any remaining allegations of Paragraph 29.d. of the First Amended
21 Complaint.

22 30. Paragraph 30 of the First Amended Complaint contains legal conclusions to which
23 no response is required. To the extent that a response is deemed required, Defendants admit that
24 this Court has jurisdiction over CGI. Defendants deny any remaining allegations of Paragraph 30
25 of the First Amended Complaint.

26 31. Paragraph 31 of the First Amended Complaint contains legal conclusions to which
27 no response is required. To the extent that a response is deemed required, Defendants deny the
28 allegations of Paragraph 31 of the First Amended Complaint.

INTRA-DISTRICT ASSIGNMENT

32. Defendants admit that this action is properly assigned to any of the divisions in this District. Defendants deny any remaining allegations of Paragraph 32 of the First Amended Complaint.

BACKGROUND

Alleged Infringement of the '537 and '200 Patents by the MGISEQ and BGISEQ Systems

33. Defendants admit that the '537 Patent, entitled "Labelled Nucleotides" issued on July 28, 2009, and that the inventors named on the face of the '537 Patent are Shankar Balasubramanian, Colin Barnes, Xioahai Liu, John Milton, Harold Swerdlow, and Xioalin Wu. Defendants admit that a copy of the '537 Patent appears to be attached to the First Amended Complaint as Ex. 1. Defendants lack sufficient information to admit or deny the remaining allegations of Paragraph 33 of the First Amended Complaint, and on that basis, deny them.

34. Defendants admit that the '200 Patent, entitled "Labelled Nucleotides" issued on August 9, 2016, and that the inventors named on the face of the '200 Patent are Shankar Balasubramanian, Colin Barnes, Xioahai Liu, and John Milton. Defendants admit that a copy of the '537 Patent appears to be attached to the First Amended Complaint as Ex. 2. Defendants lack sufficient information to admit or deny the remaining allegations of Paragraph 34 of the First Amended Complaint, and on that basis, deny them.

35. Defendants admit that members of the BGI Group launched the BGISEQ-500 in October of 2015. Defendants admit that members of the BGI Group launched the BGISEQ-50 in November of 2016. Defendants admit that MGI Tech launched the MGISEQ-200 and the MGISEQ-2000 in October of 2017. Defendants admit that MGI Tech launched the MGISEQ-T7 in October of 2018. Defendants admit that the BGISEQ-500, BGISEQ-50, MGISEQ-200, MGISEQ-2000, and MGISEQ-T7 are identified on MGI Tech's website and product literature. Defendants admit that CGI contributed to the development of the BGISEQ-500. Defendants deny any remaining allegations of Paragraph 35 of the First Amended Complaint.

36. Defendants admit that Ex. 22 of the First Amended Complaint states that "[a]ccording to MGI CSO Rade Drmanac, the current sequencing chemistry relies on stepwise

1 sequencing-by-synthesis (SBS) where 3'-blocked nucleotides are labeled with cleavable
2 fluorescent dyes, which leave behind a molecular 'scar' after they are removed. This chemistry is
3 similar to that used by Illumina and others." Defendants deny any remaining allegations of
4 Paragraph 36 of the Complaint.

5 37. Paragraph 37 of the First Amended Complaint contains legal conclusions to which
6 no response is required. To the extent that a response is deemed required, Defendants admit that
7 a claim chart is attached to the First Amended Complaint as Ex. 3. To the extent Illumina seeks
8 to incorporate Ex. 3 of the First Amended Complaint as an allegation, the allegations do not
9 comply with Federal Rule of Civil Procedure 8(d), which requires that "each allegation must be
10 simple, concise, and direct." Furthermore, the allegations in Ex. 3 of the First Amended
11 Complaint are vague, ambiguous, and lacking specificity as Illumina has indicated that Ex. 3 of
12 the First Amended Complaint is not intended to limit Illumina's right to modify the chart, and that
13 the chart is "preliminary and exemplary." Defendants deny any remaining allegations of
14 Paragraph 37 of the First Amended Complaint.

15 38. Paragraph 38 of the First Amended Complaint contains legal conclusions to which
16 no response is required. To the extent that a response is deemed required, Defendants admit that
17 certain BGISEQ and MGISEQ sequencers have been used at the San Jose, California facility.
18 Defendants deny any remaining allegations of Paragraph 38 of the First Amended Complaint.

19 39. Paragraph 39 of the First Amended Complaint contains legal conclusions to which
20 no response is required. To the extent that a response is deemed required, Defendants deny the
21 allegations of Paragraph 39 of the First Amended Complaint.

22 40. Paragraph 40 of the First Amended Complaint contains legal conclusions to which
23 no response is required. To the extent that a response is deemed required, Defendants deny the
24 allegations of Paragraph 40 of the First Amended Complaint.

25 41. Paragraph 41 of the First Amended Complaint contains legal conclusions to which
26 no response is required. To the extent that a response is deemed required, Defendants admit that
27 a claim chart is attached to the First Amended Complaint as Ex. 4. To the extent Illumina seeks
28 to incorporate Ex. 4 of the First Amended Complaint as an allegation, the allegations do not

1 comply with Federal Rule of Civil Procedure 8(d), which requires that “each allegation must be
 2 simple, concise, and direct.” Furthermore, the allegations in Ex. 4 of the First Amended
 3 Complaint are vague, ambiguous, and lacking specificity as Illumina has indicated that Ex. 4 of
 4 the First Amended Complaint is not intended to limit Illumina’s right to modify the chart, and that
 5 the chart is “preliminary and exemplary.” Defendants deny any remaining allegations of
 6 Paragraph 41 of the First Amended Complaint.

7 42. Paragraph 42 of the First Amended Complaint contains legal conclusions to which
 8 no response is required. To the extent that a response is deemed required, Defendants admit that
 9 certain BGISEQ and MGISEQ have been used by Complete Genomics at the San Jose, California
 10 facility. Defendants deny any remaining allegations of Paragraph 42 of the First Amended
 11 Complaint.

12 43. Paragraph 43 of the First Amended Complaint contains legal conclusions to which
 13 no response is required. To the extent that a response is deemed required, Defendants deny the
 14 allegations of Paragraph 43 of the First Amended Complaint.

15 44. Paragraph 44 of the First Amended Complaint contains legal conclusions to which
 16 no response is required. To the extent that a response is deemed required, Defendants deny the
 17 allegations of Paragraph 44 of the First Amended Complaint.

18 **COUNT I**

19 **Alleged Infringement of U.S. Patent No. 7,566,537 (“’537 Patent”)**

20 45. Defendants repeat and reallege their answers to Paragraphs 1-44 of the First
 21 Amended Complaint as if fully set forth herein.

22 46. Paragraph 46 of the First Amended Complaint contains legal conclusions to which
 23 no response is required. To the extent that a response is deemed required, Defendants deny the
 24 allegations of Paragraph 46 of the First Amended Complaint.

25 **BGI Genomics’ Alleged Infringement of the ’537 Patent**

26 47. Paragraph 47 of the First Amended Complaint contains legal conclusions to which
 27 no response is required. To the extent that a response is deemed required, Defendants admit that
 28

1 BGI Genomics has had knowledge of the '537 Patent since at least October 5, 2017. Defendants
2 deny any remaining allegations of Paragraph 47 of the First Amended Complaint.

3 48. Paragraph 48 of the First Amended Complaint contains legal conclusions to which
4 no response is required. To the extent that a response is deemed required, Defendants deny the
5 allegations of Paragraph 48 of the First Amended Complaint.

6 Alleged Direct Infringement by BGI Genomics

7 49. Paragraph 49 of the First Amended Complaint contains legal conclusions to which
8 no response is required. To the extent that a response is deemed required, Defendants deny the
9 allegations of Paragraph 49 of the First Amended Complaint.

10 50. Paragraph 50 of the First Amended Complaint contains legal conclusions to which
11 no response is required. To the extent that a response is deemed required, Defendants admit that
12 CGI contributed to the development of the BGISEQ-500. Defendants deny any remaining
13 allegations of Paragraph 50 of the First Amended Complaint.

14 51. Paragraph 51 of the First Amended Complaint contains legal conclusions to which
15 no response is required. To the extent that a response is deemed required, Defendants admit that
16 Ex. 5 of the First Amended Complaint depicts "Representative Offices" in San Francisco, Los
17 Angeles, and San Diego, California and an "Office/Lab" in San Jose, California, and that CGI
18 identified BGI Genomics as a real-party-in-interest in IPR proceedings directed to the '537
19 Patent. Defendants deny any remaining allegations of Paragraph 51 of the First Amended
20 Complaint.

21 52. Paragraph 52 of the First Amended Complaint contains legal conclusions to which
22 no response is required. To the extent that a response is deemed required, Defendants admit that
23 BGI Genomics has had a presence at industry trade shows in California, including those listed in
24 Paragraph 52 of the First Amended Complaint and that BGI Genomics' CEO, Ye Yin, presented
25 at the J.P. Morgan Health Care Conference in January of 2018. Defendants deny any remaining
26 allegations of Paragraph 52 of the First Amended Complaint.

Alleged Induced Infringement by BGI Genomics

53. Paragraph 53 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 53 of the First Amended Complaint.

54. Paragraph 54 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 54 of the First Amended Complaint.

55. Paragraph 55 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 55 of the First Amended Complaint.

56. Paragraph 56 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 56 of the First Amended Complaint.

57. Paragraph 57 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 57 of the First Amended Complaint.

58. Paragraph 58 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 58 of the First Amended Complaint.

59. Paragraph 59 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 59 of the First Amended Complaint.

60. Paragraph 60 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 60 of the First Amended Complaint.

Alleged Contributory Infringement by BGI Genomics

61. Paragraph 61 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 61 of the First Amended Complaint.

62. Paragraph 62 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 62 of the First Amended Complaint.

Alleged Willful Infringement by BGI Genomics

63. Paragraph 63 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 63 of the First Amended Complaint.

64. Paragraph 64 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 64 of the First Amended Complaint.

65. Paragraph 65 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 65 of the First Amended Complaint.

BGI Americas' Alleged Infringement of the '537 Patent

66. Paragraph 66 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that BGI Americas has had knowledge of the '537 Patent since at least October 5, 2017. Defendants deny any remaining allegations of Paragraph 66 of the First Amended Complaint.

Alleged Direct Infringement by BGI Americas

67. Paragraph 67 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 67 of the First Amended Complaint.

Alleged Induced Infringement by BGI Americas

68. Paragraph 68 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 68 of the First Amended Complaint.

69. Paragraph 69 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 69 of the First Amended Complaint.

70. Paragraph 70 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 70 of the First Amended Complaint.

71. Paragraph 71 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 71 of the First Amended Complaint.

72. Paragraph 72 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 72 of the First Amended Complaint.

73. Paragraph 73 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 73 of the First Amended Complaint.

Alleged Contributory Infringement by BGI Americas

74. Paragraph 74 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 74 of the First Amended Complaint.

75. Paragraph 75 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 75 of the First Amended Complaint.

1 Alleged Willful Infringement by BGI Americas

2 76. Paragraph 76 of the First Amended Complaint contains legal conclusions to which
3 no response is required. To the extent that a response is deemed required, Defendants deny the
4 allegations of Paragraph 76 of the First Amended Complaint.

5 77. Paragraph 77 of the First Amended Complaint contains legal conclusions to which
6 no response is required. To the extent that a response is deemed required, Defendants deny the
7 allegations of Paragraph 77 of the First Amended Complaint.

8 78. Paragraph 78 of the First Amended Complaint contains legal conclusions to which
9 no response is required. To the extent that a response is deemed required, Defendants deny the
10 allegations of Paragraph 78 of the First Amended Complaint.

11 **MGI Tech's Alleged Infringement of the '537 Patent**

12 79. Paragraph 79 of the First Amended Complaint contains legal conclusions to which
13 no response is required. To the extent that a response is deemed required, Defendants deny the
14 allegations of Paragraph 79 of the First Amended Complaint.

15 Alleged Direct Infringement by MGI Tech

16 80. Paragraph 80 of the First Amended Complaint contains legal conclusions to which
17 no response is required. To the extent that a response is deemed required, Defendants deny the
18 allegations of Paragraph 80 of the First Amended Complaint.

19 Alleged Induced Infringement by MGI Tech

20 81. Paragraph 81 of the First Amended Complaint contains legal conclusions to which
21 no response is required. To the extent that a response is deemed required, Defendants deny the
22 allegations of Paragraph 81 of the First Amended Complaint.

23 82. Paragraph 82 of the First Amended Complaint contains legal conclusions to which
24 no response is required. To the extent that a response is deemed required, Defendants deny the
25 allegations of Paragraph 82 of the First Amended Complaint.

1 83. Paragraph 83 of the First Amended Complaint contains legal conclusions to which
2 no response is required. To the extent that a response is deemed required, Defendants deny the
3 allegations of Paragraph 83 of the First Amended Complaint.³

4 84. Paragraph 84 of the First Amended Complaint contains legal conclusions to which
5 no response is required. To the extent that a response is deemed required, Defendants deny the
6 allegations of Paragraph 84 of the First Amended Complaint.

7 85. Paragraph 85 of the First Amended Complaint contains legal conclusions to which
8 no response is required. To the extent that a response is deemed required, Defendants deny the
9 allegations of Paragraph 85 of the First Amended Complaint.

10 86. Paragraph 86 of the First Amended Complaint contains legal conclusions to which
11 no response is required. To the extent that a response is deemed required, Defendants deny the
12 allegations of Paragraph 86 of the First Amended Complaint.

13 87. Paragraph 87 of the First Amended Complaint contains legal conclusions to which
14 no response is required. To the extent that a response is deemed required, Defendants deny the
15 allegations of Paragraph 87 of the First Amended Complaint.

16 Alleged Contributory Infringement by MGI Tech

17 88. Paragraph 88 of the First Amended Complaint contains legal conclusions to which
18 no response is required. To the extent that a response is deemed required, Defendants deny the
19 allegations of Paragraph 88 of the First Amended Complaint.

20 89. Paragraph 89 of the First Amended Complaint contains legal conclusions to which
21 no response is required. To the extent that a response is deemed required, Defendants deny the
22 allegations of Paragraph 89 of the First Amended Complaint.

23
24
25
26 ³ Defendants note that there is an un-numbered paragraph appearing after Paragraph 83 of
27 Illumina's First Amended Complaint. See D.N. 52 at 26:4-11. This un-numbered paragraph of
28 the First Amended Complaint contains legal conclusions to which no response is required. To the
extent that a response is deemed required, Defendants deny the allegations of this paragraph.

1 Alleged Willful Infringement by MGI Tech

2 90. Paragraph 90 of the First Amended Complaint contains legal conclusions to which
3 no response is required. To the extent that a response is deemed required, Defendants deny the
4 allegations of Paragraph 90 of the First Amended Complaint.

5 91. Paragraph 91 of the First Amended Complaint contains legal conclusions to which
6 no response is required. To the extent that a response is deemed required, Defendants deny the
7 allegations of Paragraph 91 of the First Amended Complaint.

8 92. Paragraph 92 of the First Amended Complaint contains legal conclusions to which
9 no response is required. To the extent that a response is deemed required, Defendants deny the
10 allegations of Paragraph 92 of the First Amended Complaint.

11 **MGI Americas' Alleged Infringement of the '537 Patent**

12 93. Paragraph 93 of the First Amended Complaint contains legal conclusions to which
13 no response is required. To the extent that a response is deemed required, Defendants deny the
14 allegations of Paragraph 93 of the First Amended Complaint.

15 Alleged Direct Infringement by MGI Americas

16 94. Paragraph 94 of the First Amended Complaint contains legal conclusions to which
17 no response is required. To the extent that a response is deemed required, Defendants admit that
18 MGI Americas has used certain BGISEQ and MGISEQ sequencers at their San Jose, California
19 facility. Defendants deny any remaining allegations of Paragraph 94 of the First Amended
20 Complaint.

21 Alleged Induced Infringement by MGI Americas

22 95. Paragraph 95 of the First Amended Complaint contains legal conclusions to which
23 no response is required. To the extent that a response is deemed required, Defendants deny the
24 allegations of Paragraph 95 of the First Amended Complaint.

25 96. Paragraph 96 of the First Amended Complaint contains legal conclusions to which
26 no response is required. To the extent that a response is deemed required, Defendants deny the
27 allegations of Paragraph 96 of the First Amended Complaint.
28

1 97. Paragraph 97 of the First Amended Complaint contains legal conclusions to which
2 no response is required. To the extent that a response is deemed required, Defendants deny the
3 allegations of Paragraph 97 of the First Amended Complaint.

4 98. Paragraph 98 of the First Amended Complaint contains legal conclusions to which
5 no response is required. To the extent that a response is deemed required, Defendants deny the
6 allegations of Paragraph 98 of the First Amended Complaint.

7 99. Paragraph 99 of the First Amended Complaint contains legal conclusions to which
8 no response is required. To the extent that a response is deemed required, Defendants deny the
9 allegations of Paragraph 99 of the First Amended Complaint.

10 100. Paragraph 100 of the First Amended Complaint contains legal conclusions to
11 which no response is required. To the extent that a response is deemed required, Defendants deny
12 the allegations of Paragraph 100 of the First Amended Complaint.

13 101. Paragraph 101 of the First Amended Complaint contains legal conclusions to
14 which no response is required. To the extent that a response is deemed required, Defendants deny
15 the allegations of Paragraph 101 of the First Amended Complaint.

16 102. Paragraph 102 of the First Amended Complaint contains legal conclusions to
17 which no response is required. To the extent that a response is deemed required, Defendants deny
18 the allegations of Paragraph 102 of the First Amended Complaint.

19 Alleged Contributory Infringement by MGI Americas

20 103. Paragraph 103 of the First Amended Complaint contains legal conclusions to
21 which no response is required. To the extent that a response is deemed required, Defendants deny
22 the allegations of Paragraph 103 of the First Amended Complaint.

23 104. Paragraph 104 of the First Amended Complaint contains legal conclusions to
24 which no response is required. To the extent that a response is deemed required, Defendants deny
25 the allegations of Paragraph 104 of the First Amended Complaint.

1 Alleged Willful Infringement by MGI Americas

2 105. Paragraph 105 of the First Amended Complaint contains legal conclusions to
3 which no response is required. To the extent that a response is deemed required, Defendants deny
4 the allegations of Paragraph 105 of the First Amended Complaint.

5 106. Paragraph 106 of the First Amended Complaint contains legal conclusions to
6 which no response is required. To the extent that a response is deemed required, Defendants deny
7 the allegations of Paragraph 106 of the First Amended Complaint.

8 107. Paragraph 107 of the First Amended Complaint contains legal conclusions to
9 which no response is required. To the extent that a response is deemed required, Defendants deny
10 the allegations of Paragraph 107 of the First Amended Complaint.

11 CGI's Alleged Infringement of the '537 Patent

12 108. Paragraph 108 of the First Amended Complaint contains legal conclusions to
13 which no response is required. To the extent that a response is deemed required, Defendants deny
14 the allegations of Paragraph 108 of the First Amended Complaint.

15 Alleged Direct Infringement by CGI

16 109. Paragraph 109 of the First Amended Complaint contains legal conclusions to
17 which no response is required. To the extent that a response is deemed required, Defendants
18 admit that CGI has used certain BGISEQ and MGISEQ sequencers at its San Jose, California
19 facility. Defendants deny any remaining allegations of Paragraph 109 of the First Amended
20 Complaint.

21 Alleged Induced Infringement by CGI

22 110. Paragraph 110 of the First Amended Complaint contains legal conclusions to
23 which no response is required. To the extent that a response is deemed required, Defendants deny
24 the allegations of Paragraph 110 of the First Amended Complaint.

25 111. Paragraph 111 of the First Amended Complaint contains legal conclusions to
26 which no response is required. To the extent that a response is deemed required, Defendants deny
27 the allegations of Paragraph 111 of the First Amended Complaint.
28

1 112. Paragraph 112 of the First Amended Complaint contains legal conclusions to
2 which no response is required. To the extent that a response is deemed required, Defendants deny
3 the allegations of Paragraph 112 of the First Amended Complaint.

4 113. Paragraph 113 of the First Amended Complaint contains legal conclusions to
5 which no response is required. To the extent that a response is deemed required, Defendants deny
6 the allegations of Paragraph 113 of the First Amended Complaint.

7 114. Paragraph 114 of the First Amended Complaint contains legal conclusions to
8 which no response is required. To the extent that a response is deemed required, Defendants deny
9 the allegations of Paragraph 114 of the First Amended Complaint.

10 115. Paragraph 115 of the First Amended Complaint contains legal conclusions to
11 which no response is required. To the extent that a response is deemed required, Defendants deny
12 the allegations of Paragraph 115 of the First Amended Complaint.

13 116. Paragraph 116 of the First Amended Complaint contains legal conclusions to
14 which no response is required. To the extent that a response is deemed required, Defendants deny
15 the allegations of Paragraph 116 of the First Amended Complaint.

16 117. Paragraph 117 of the First Amended Complaint contains legal conclusions to
17 which no response is required. To the extent that a response is deemed required, Defendants deny
18 the allegations of Paragraph 117 of the First Amended Complaint.

19 Alleged Contributory Infringement by CGI

20 118. Paragraph 118 of the First Amended Complaint contains legal conclusions to
21 which no response is required. To the extent that a response is deemed required, Defendants deny
22 the allegations of Paragraph 118 of the First Amended Complaint.

23 119. Paragraph 119 of the First Amended Complaint contains legal conclusions to
24 which no response is required. To the extent that a response is deemed required, Defendants deny
25 the allegations of Paragraph 119 of the First Amended Complaint.

26 Alleged Willful Infringement by CGI

27 120. Paragraph 120 of the First Amended Complaint contains legal conclusions to
28 which no response is required. To the extent that a response is deemed required, Defendants

1 admit that CGI has had knowledge of the '537 Patent since at least October 5, 2017. Defendants
2 deny any remaining allegations of Paragraph 120 of the First Amended Complaint.

3 121. Paragraph 121 of the First Amended Complaint contains legal conclusions to
4 which no response is required. To the extent that a response is deemed required, Defendants deny
5 the allegations of Paragraph 121 of the First Amended Complaint.

6 122. Paragraph 122 of the First Amended Complaint contains legal conclusions to
7 which no response is required. To the extent that a response is deemed required, Defendants deny
8 the allegations of Paragraph 122 of the First Amended Complaint.

9 **COUNT II**

10 **Alleged Infringement of U.S. Patent No. 9,410,200 ("200 Patent")**

11 123. Defendants repeat and reallege their answers to Paragraphs 1-122 of the First
12 Amended Complaint as if fully set forth herein.

13 124. Paragraph 124 of the First Amended Complaint contains legal conclusions to
14 which no response is required. To the extent that a response is deemed required, Defendants deny
15 the allegations of Paragraph 124 of the First Amended Complaint.

16 **BGI Genomics' Alleged Infringement of the '200 Patent**

17 125. Paragraph 125 of the First Amended Complaint contains legal conclusions to
18 which no response is required. To the extent that a response is deemed required, Defendants deny
19 the allegations of Paragraph 125 of the First Amended Complaint.

20 126. Paragraph 126 of the First Amended Complaint contains legal conclusions to
21 which no response is required. To the extent that a response is deemed required, Defendants deny
22 the allegations of Paragraph 126 of the First Amended Complaint.

23 **Alleged Direct Infringement by BGI Genomics**

24 127. Paragraph 127 of the First Amended Complaint contains legal conclusions to
25 which no response is required. To the extent that a response is deemed required, Defendants deny
26 the allegations of Paragraph 127 of the First Amended Complaint.

27 128. Paragraph 128 of the First Amended Complaint contains legal conclusions to
28 which no response is required. To the extent that a response is deemed required, Defendants

1 admit that CGI contributed to the development of the BGISEQ-500. Defendants deny any
2 remaining allegations of Paragraph 128 of the First Amended Complaint.

3 129. Paragraph 129 of the First Amended Complaint contains legal conclusions to
4 which no response is required. To the extent that a response is deemed required, Defendants
5 admit that Ex. 5 of the First Amended Complaint depicts “Representative Offices” in San
6 Francisco, Los Angeles, and San Diego, California and an “Office/Lab” in San Jose, California,
7 and that CGI identified BGI Genomics as a real-party-in-interest in IPR proceedings directed to
8 the ’537 Patent. Defendants deny any remaining allegations of Paragraph 129 of the First
9 Amended Complaint.

10 130. Paragraph 130 of the First Amended Complaint contains legal conclusions to
11 which no response is required. To the extent that a response is deemed required, Defendants
12 admit that Defendants admit that BGI Genomics has had a presence at industry trade shows in
13 California, including those listed in Paragraph 130 of the First Amended Complaint and that BGI
14 Genomics’ CEO, Ye Yin, presented at the J.P. Morgan Health Care Conference in January of
15 2018. Defendants deny any remaining allegations of Paragraph 130 of the First Amended
16 Complaint.

17 Alleged Induced Infringement by BGI Genomics

18 131. Paragraph 131 of the First Amended Complaint contains legal conclusions to
19 which no response is required. To the extent that a response is deemed required, Defendants deny
20 the allegations of Paragraph 131 of the First Amended Complaint.

21 132. Paragraph 132 of the First Amended Complaint contains legal conclusions to
22 which no response is required. To the extent that a response is deemed required, Defendants deny
23 the allegations of Paragraph 132 of the First Amended Complaint.

24 133. Paragraph 133 of the First Amended Complaint contains legal conclusions to
25 which no response is required. To the extent that a response is deemed required, Defendants deny
26 the allegations of Paragraph 133 of the First Amended Complaint.

1 134. Paragraph 134 of the First Amended Complaint contains legal conclusions to
2 which no response is required. To the extent that a response is deemed required, Defendants deny
3 the allegations of Paragraph 134 of the First Amended Complaint.

4 135. Paragraph 135 of the First Amended Complaint contains legal conclusions to
5 which no response is required. To the extent that a response is deemed required, Defendants deny
6 the allegations of Paragraph 135 of the First Amended Complaint.

7 136. Paragraph 136 of the First Amended Complaint contains legal conclusions to
8 which no response is required. To the extent that a response is deemed required, Defendants deny
9 the allegations of Paragraph 136 of the First Amended Complaint.

10 137. Paragraph 137 of the First Amended Complaint contains legal conclusions to
11 which no response is required. To the extent that a response is deemed required, Defendants deny
12 the allegations of Paragraph 137 of the First Amended Complaint.

13 138. Paragraph 138 of the First Amended Complaint contains legal conclusions to
14 which no response is required. To the extent that a response is deemed required, Defendants deny
15 the allegations of Paragraph 138 of the First Amended Complaint.

16 Alleged Contributory Infringement by BGI Genomics

17 139. Paragraph 139 of the First Amended Complaint contains legal conclusions to
18 which no response is required. To the extent that a response is deemed required, Defendants deny
19 the allegations of Paragraph 139 of the First Amended Complaint.

20 140. Paragraph 140 of the First Amended Complaint contains legal conclusions to
21 which no response is required. To the extent that a response is deemed required, Defendants deny
22 the allegations of Paragraph 140 of the First Amended Complaint.

23 Alleged Willful Infringement by BGI Genomics

24 141. Paragraph 141 of the First Amended Complaint contains legal conclusions to
25 which no response is required. To the extent that a response is deemed required, Defendants deny
26 the allegations of Paragraph 141 of the First Amended Complaint.

1 142. Paragraph 142 of the First Amended Complaint contains legal conclusions to
2 which no response is required. To the extent that a response is deemed required, Defendants deny
3 the allegations of Paragraph 142 of the First Amended Complaint.

4 143. Paragraph 143 of the First Amended Complaint contains legal conclusions to
5 which no response is required. To the extent that a response is deemed required, Defendants deny
6 the allegations of Paragraph 143 of the First Amended Complaint.

7 **BGI Americas' Alleged Infringement of the '200 Patent**

8 144. Paragraph 144 of the First Amended Complaint contains legal conclusions to
9 which no response is required. To the extent that a response is deemed required, Defendants deny
10 the allegations of Paragraph 144 of the First Amended Complaint.

11 **Alleged Direct Infringement by BGI Americas**

12 145. Paragraph 145 of the First Amended Complaint contains legal conclusions to
13 which no response is required. To the extent that a response is deemed required, Defendants deny
14 the allegations of Paragraph 145 of the First Amended Complaint.

15 **Alleged Induced Infringement by BGI Americas**

16 146. Paragraph 146 of the First Amended Complaint contains legal conclusions to
17 which no response is required. To the extent that a response is deemed required, Defendants deny
18 the allegations of Paragraph 146 of the First Amended Complaint.

19 147. Paragraph 147 of the First Amended Complaint contains legal conclusions to
20 which no response is required. To the extent that a response is deemed required, Defendants deny
21 the allegations of Paragraph 147 of the First Amended Complaint.

22 148. Paragraph 148 of the First Amended Complaint contains legal conclusions to
23 which no response is required. To the extent that a response is deemed required, Defendants deny
24 the allegations of Paragraph 148 of the First Amended Complaint.

25 149. Paragraph 149 of the First Amended Complaint contains legal conclusions to
26 which no response is required. To the extent that a response is deemed required, Defendants deny
27 the allegations of Paragraph 149 of the First Amended Complaint.
28

1 150. Paragraph 150 of the First Amended Complaint contains legal conclusions to
2 which no response is required. To the extent that a response is deemed required, Defendants deny
3 the allegations of Paragraph 150 of the First Amended Complaint.

4 151. Paragraph 151 of the First Amended Complaint contains legal conclusions to
5 which no response is required. To the extent that a response is deemed required, Defendants deny
6 the allegations of Paragraph 151 of the First Amended Complaint.

7 Alleged Contributory Infringement by BGI Americas

8 152. Paragraph 152 of the First Amended Complaint contains legal conclusions to
9 which no response is required. To the extent that a response is deemed required, Defendants deny
10 the allegations of Paragraph 152 of the First Amended Complaint.

11 153. Paragraph 153 of the First Amended Complaint contains legal conclusions to
12 which no response is required. To the extent that a response is deemed required, Defendants deny
13 the allegations of Paragraph 153 of the First Amended Complaint.

14 Alleged Willful Infringement by BGI Americas

15 154. Paragraph 154 of the First Amended Complaint contains legal conclusions to
16 which no response is required. To the extent that a response is deemed required, Defendants deny
17 the allegations of Paragraph 154 of the First Amended Complaint.

18 155. Paragraph 155 of the First Amended Complaint contains legal conclusions to
19 which no response is required. To the extent that a response is deemed required, Defendants deny
20 the allegations of Paragraph 155 of the First Amended Complaint.

21 156. Paragraph 156 of the First Amended Complaint contains legal conclusions to
22 which no response is required. To the extent that a response is deemed required, Defendants deny
23 the allegations of Paragraph 156 of the First Amended Complaint.

24 **MGI Tech's Alleged Infringement of the '200 Patent**

25 157. Paragraph 157 of the First Amended Complaint contains legal conclusions to
26 which no response is required. To the extent that a response is deemed required, Defendants deny
27 the allegations of Paragraph 157 of the First Amended Complaint.
28

1 Alleged Direct Infringement by MGI Tech

2 158. Paragraph 158 of the First Amended Complaint contains legal conclusions to
3 which no response is required. To the extent that a response is deemed required, Defendants deny
4 the allegations of Paragraph 158 of the First Amended Complaint.

5 Alleged Induced Infringement by MGI Tech

6 159. Paragraph 159 of the First Amended Complaint contains legal conclusions to
7 which no response is required. To the extent that a response is deemed required, Defendants deny
8 the allegations of Paragraph 159 of the First Amended Complaint.

9 160. Paragraph 160 of the First Amended Complaint contains legal conclusions to
10 which no response is required. To the extent that a response is deemed required, Defendants deny
11 the allegations of Paragraph 160 of the First Amended Complaint.

12 161. Paragraph 161 of the First Amended Complaint contains legal conclusions to
13 which no response is required. To the extent that a response is deemed required, Defendants deny
14 the allegations of Paragraph 161 of the First Amended Complaint.

15 162. Paragraph 162 of the First Amended Complaint contains legal conclusions to
16 which no response is required. To the extent that a response is deemed required, Defendants deny
17 the allegations of Paragraph 162 of the First Amended Complaint.

18 163. Paragraph 163 of the First Amended Complaint contains legal conclusions to
19 which no response is required. To the extent that a response is deemed required, Defendants deny
20 the allegations of Paragraph 163 of the First Amended Complaint.

21 164. Paragraph 164 of the First Amended Complaint contains legal conclusions to
22 which no response is required. To the extent that a response is deemed required, Defendants deny
23 the allegations of Paragraph 164 of the First Amended Complaint.

24 165. Paragraph 165 of the First Amended Complaint contains legal conclusions to
25 which no response is required. To the extent that a response is deemed required, Defendants deny
26 the allegations of Paragraph 165 of the First Amended Complaint.

1 166. Paragraph 166 of the First Amended Complaint contains legal conclusions to
2 which no response is required. To the extent that a response is deemed required, Defendants deny
3 the allegations of Paragraph 166 of the First Amended Complaint.

4 Alleged Contributory Infringement by MGI Tech

5 167. Paragraph 167 of the First Amended Complaint contains legal conclusions to
6 which no response is required. To the extent that a response is deemed required, Defendants deny
7 the allegations of Paragraph 167 of the First Amended Complaint.

8 168. Paragraph 168 of the First Amended Complaint contains legal conclusions to
9 which no response is required. To the extent that a response is deemed required, Defendants deny
10 the allegations of Paragraph 168 of the First Amended Complaint.

11 Alleged Willful Infringement by MGI Tech

12 169. Paragraph 169 of the First Amended Complaint contains legal conclusions to
13 which no response is required. To the extent that a response is deemed required, Defendants deny
14 the allegations of Paragraph 169 of the First Amended Complaint.

15 170. Paragraph 170 of the First Amended Complaint contains legal conclusions to
16 which no response is required. To the extent that a response is deemed required, Defendants deny
17 the allegations of Paragraph 170 of the First Amended Complaint.

18 171. Paragraph 171 of the First Amended Complaint contains legal conclusions to
19 which no response is required. To the extent that a response is deemed required, Defendants deny
20 the allegations of Paragraph 171 of the First Amended Complaint.

21 **MGI Americas' Alleged Infringement of the '200 Patent**

22 172. Paragraph 172 of the First Amended Complaint contains legal conclusions to
23 which no response is required. To the extent that a response is deemed required, Defendants deny
24 the allegations of Paragraph 172 of the First Amended Complaint.

25 Alleged Direct Infringement by MGI Americas

26 173. Paragraph 173 of the First Amended Complaint contains legal conclusions to
27 which no response is required. To the extent that a response is deemed required, Defendants
28 admit that MGI Americas has used certain BGISEQ and MGISEQ sequencers at its San Jose,

1 California facility. Defendants deny any remaining allegations of Paragraph 173 of the First
2 Amended Complaint.

3 Alleged Induced Infringement by MGI Americas

4 174. Paragraph 174 of the First Amended Complaint contains legal conclusions to
5 which no response is required. To the extent that a response is deemed required, Defendants deny
6 the allegations of Paragraph 174 of the First Amended Complaint.

7 175. Paragraph 175 of the First Amended Complaint contains legal conclusions to
8 which no response is required. To the extent that a response is deemed required, Defendants deny
9 the allegations of Paragraph 175 of the First Amended Complaint.

10 176. Paragraph 176 of the First Amended Complaint contains legal conclusions to
11 which no response is required. To the extent that a response is deemed required, Defendants deny
12 the allegations of Paragraph 176 of the First Amended Complaint.

13 177. Paragraph 177 of the First Amended Complaint contains legal conclusions to
14 which no response is required. To the extent that a response is deemed required, Defendants deny
15 the allegations of Paragraph 177 of the First Amended Complaint.

16 178. Paragraph 178 of the First Amended Complaint contains legal conclusions to
17 which no response is required. To the extent that a response is deemed required, Defendants deny
18 the allegations of Paragraph 178 of the First Amended Complaint.

19 179. Paragraph 179 of the First Amended Complaint contains legal conclusions to
20 which no response is required. To the extent that a response is deemed required, Defendants deny
21 the allegations of Paragraph 179 of the First Amended Complaint.

22 180. Paragraph 180 of the First Amended Complaint contains legal conclusions to
23 which no response is required. To the extent that a response is deemed required, Defendants deny
24 the allegations of Paragraph 180 of the First Amended Complaint.

25 181. Paragraph 181 of the First Amended Complaint contains legal conclusions to
26 which no response is required. To the extent that a response is deemed required, Defendants deny
27 the allegations of Paragraph 181 of the First Amended Complaint.
28

1 Alleged Contributory Infringement by MGI Americas

2 182. Paragraph 182 of the First Amended Complaint contains legal conclusions to
3 which no response is required. To the extent that a response is deemed required, Defendants deny
4 the allegations of Paragraph 182 of the First Amended Complaint.

5 183. Paragraph 183 of the First Amended Complaint contains legal conclusions to
6 which no response is required. To the extent that a response is deemed required, Defendants deny
7 the allegations of Paragraph 183 of the First Amended Complaint.

8 Alleged Willful Infringement by MGI Americas

9 184. Paragraph 184 of the First Amended Complaint contains legal conclusions to
10 which no response is required. To the extent that a response is deemed required, Defendants deny
11 the allegations of Paragraph 184 of the First Amended Complaint.

12 185. Paragraph 185 of the First Amended Complaint contains legal conclusions to
13 which no response is required. To the extent that a response is deemed required, Defendants deny
14 the allegations of Paragraph 185 of the First Amended Complaint.

15 186. Paragraph 186 of the First Amended Complaint contains legal conclusions to
16 which no response is required. To the extent that a response is deemed required, Defendants deny
17 the allegations of Paragraph 186 of the First Amended Complaint.

18 **CGI's Alleged Infringement of the '200 Patent**

19 187. Paragraph 187 of the First Amended Complaint contains legal conclusions to
20 which no response is required. To the extent that a response is deemed required, Defendants deny
21 the allegations of Paragraph 187 of the First Amended Complaint.

22 Alleged Direct Infringement by CGI

23 188. Paragraph 188 of the First Amended Complaint contains legal conclusions to
24 which no response is required. To the extent that a response is deemed required, Defendants
25 admit that CGI has used certain BGISEQ and MGISEQ sequencers at its San Jose, California
26 facility. Defendants deny any remaining allegations of Paragraph 188 of the First Amended
27 Complaint.
28

1 Alleged Induced Infringement by CGI

2 189. Paragraph 189 of the First Amended Complaint contains legal conclusions to
3 which no response is required. To the extent that a response is deemed required, Defendants deny
4 the allegations of Paragraph 189 of the First Amended Complaint.

5 190. Paragraph 190 of the First Amended Complaint contains legal conclusions to
6 which no response is required. To the extent that a response is deemed required, Defendants deny
7 the allegations of Paragraph 190 of the First Amended Complaint.

8 191. Paragraph 191 of the First Amended Complaint contains legal conclusions to
9 which no response is required. To the extent that a response is deemed required, Defendants deny
10 the allegations of Paragraph 191 of the First Amended Complaint.

11 192. Paragraph 192 of the First Amended Complaint contains legal conclusions to
12 which no response is required. To the extent that a response is deemed required, Defendants deny
13 the allegations of Paragraph 192 of the First Amended Complaint.

14 193. Paragraph 193 of the First Amended Complaint contains legal conclusions to
15 which no response is required. To the extent that a response is deemed required, Defendants deny
16 the allegations of Paragraph 193 of the First Amended Complaint.

17 194. Paragraph 194 of the First Amended Complaint contains legal conclusions to
18 which no response is required. To the extent that a response is deemed required, Defendants deny
19 the allegations of Paragraph 194 of the First Amended Complaint.

20 195. Paragraph 195 of the First Amended Complaint contains legal conclusions to
21 which no response is required. To the extent that a response is deemed required, Defendants deny
22 the allegations of Paragraph 195 of the First Amended Complaint.

23 196. Paragraph 196 of the First Amended Complaint contains legal conclusions to
24 which no response is required. To the extent that a response is deemed required, Defendants deny
25 the allegations of Paragraph 196 of the First Amended Complaint.

Alleged Contributory Infringement by CGI

197. Paragraph 197 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 197 of the First Amended Complaint.

198. Paragraph 198 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 198 of the First Amended Complaint.

Alleged Willful Infringement by CGI

199. Paragraph 199 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 199 of the First Amended Complaint.

200. Paragraph 200 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 200 of the First Amended Complaint.

201. Paragraph 201 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 201 of the First Amended Complaint.

RESPONSE TO PRAYER FOR RELIEF

202. Defendants deny that Plaintiffs are entitled to any of the requested relief and denies any and all allegations contained within the Prayer for Relief of the First Amended Complaint.

RESPONSE TO DEMAND FOR JURY TRIAL

203. Plaintiffs' request for a jury trial does not require a response by Defendants. Defendants also request a jury trial of all issues triable to a jury in this action.

AFFIRMATIVE DEFENSES

204. Defendants repeat and reallege their answers to Paragraphs 1-203 of the First Amended Complaint as if fully set forth herein.

205. Defendants deny that Illumina is entitled to any relief against Defendants.

206. Without assuming any burden of proof that it would not otherwise bear, Defendants assert the following separate and additional defenses, all of which are pled in the alternative, and none of which constitute an admission that Defendants are in any way liable to Plaintiffs, that Plaintiffs have been or will be injured or damaged in any way, or that Plaintiffs are entitled to any relief whatsoever. As a defense to the First Amended Complaint and each and every allegation contained therein (unless specifically stated otherwise), Defendants allege each of the following:

FIRST DEFENSE – NONINFRINGEMENT

207. Defendants have not infringed, and are not infringing, directly, contributorily, or by inducement, any valid claim of Plaintiffs’ asserted patents, either literally or under the doctrine of equivalents. Defendants are not liable in any respect for any alleged infringement of the Plaintiffs’ asserted patents.

SECOND DEFENSE – INVALIDITY

208. Each claim of Plaintiffs’ asserted patents is invalid for failing to comply with one or more of the requirements for patentability under, including but not limited to, 35 U.S.C. §§ 101, 103, 112, and the judicial doctrine of obviousness-type double patenting. By way of example only, claim 1 of each of Plaintiffs’ asserted patents is invalid as obvious over Tsien or Ju, in combination with either or both Zavgorodny 1991 and Zavgorodny 2000.⁴ Also by way of example, claim 1 of each of Plaintiffs’ asserted patents is also invalid for failing to sufficiently describe an azido protecting group such that one of ordinary skill would have known that the inventors were in possession of the claimed invention as of the filing date. As a further example, claim 1 of each of Plaintiffs’ asserted patents is also invalid for being overly broad in scope and not adequately supported by enabling disclosure.

⁴ Roger Y. Tsien et al., WO 91/06678 A1 (published May 16, 1991) (“Tsien”); Jingyue Ju et al., U.S. Patent 6,664,079 B2 (Dec. 16, 2003) (“Ju”); Sergey Zavgorodny et al., *1-Alkylthioalkylation of Nucleoside Hydroxyl Functions and Its Synthetic Applications*, TETRAHEDRON LETTERS 32:7593-96 (1991) (“Zavgorodny”); S.G. Zavgorodny et al., *S,X-Acetals in Nucleoside Chemistry, III, Synthesis of 2'- and 3'-O-Azidomethyl Derivatives of Ribonucleosides*, NUCLEOSIDES, NUCLEOTIDES & NUCLEIC ACIDS 19:1977-91 (2000) (“Zavgorodny 2000”).

**THIRD DEFENSE – ESTOPPEL, LACHES, WAIVER, ACQUIESCENCE &
UNREASONABLE DELAY**

209. Illumina’s claims are barred, in whole or in part, by the doctrines of estoppel, laches, waiver, acquiescence and/or unreasonable delay. Illumina unreasonably delayed in bringing suit until well after each of these effects occurred, despite the substantial harm they allegedly produced. Assuming, *arguendo*, that any actionable harm occurred, this delay, in part, prevented Defendants from curing any injury with Illumina, causing material prejudice and injury to Defendants. Illumina has known that BGI Genomics and its affiliates have offered sequencing services in foreign countries and that CGI has had a research facility in the San Francisco Bay Area at least as of 2010, when CGI filed a motion to transfer a suit brought by Illumina to this District. *Illumina Inc. et al v. Complete Genomics Inc.*, Case No. 3:10-cv-05542-EDL, D.N. 12.

FOURTH DEFENSE – STATUTE OF LIMITATIONS

210. Illumina’s purported claims for patent infringement are barred, in whole or in part, to the extent that they allege acts of infringement barred by the statute of limitations. 35 U.S.C. § 286 states that “no recovery shall be had for any infringement committed more than six years prior to the filing of the complaint or counterclaim for infringement in the action.” *See* 35 U.S.C. § 286. Therefore, Illumina is not entitled to recover damages from any period before six years prior to the filing of the complaint in this matter.

FIFTH DEFENSE – ADEQUATE REMEDY AT LAW

211. Illumina has an adequate remedy at law and the alleged injury to Illumina is not immediate or irreparable. Any injury, to the extent any occurred, could be cured with damages alone. Accordingly, there is no factual or legal basis for a grant of equitable relief.

RESERVATION OF ALL AFFIRMATIVE DEFENSES

212. Defendants reserve the right to offer any other and additional defense that is now or may become available or appear during, or as a result of, discovery proceedings in this action.

COUNTERCLAIMS

Complete Genomics, Inc. (“CGI” or “Counterclaim-Plaintiff”) asserts the following allegations and counterclaims against Illumina, Inc. and Illumina Cambridge Ltd. (collectively, “Illumina” or “Counterclaim-Defendants”).

THE COUNTERCLAIM PARTIES

1. Counterclaim-Plaintiff CGI is a privately held research company with its principal place of business at 2904 Orchard Way, San Jose, California 95134.
2. CGI is incorporated under the laws of the State of Delaware.
3. Defendant Illumina, Inc. is a Delaware corporation with its principal place of business at 5200 Illumina Way, San Diego, California 92122.

JURISDICTION AND VENUE

4. This Court has personal jurisdiction over Illumina because it initiated the present lawsuit. Moreover Illumina has numerous offices and employees in California, including in this District, and has filed previous litigation in this Court. Upon information and belief, Illumina has systematic and continuous contacts in this judicial district, regularly transacts business within this district, and regularly avails itself of the benefits of this District. Upon information and belief, Illumina also sells, distributes, and supports accused products (and products for practicing accused methods) as well as practices the accused methods in this District and derives substantial revenues from sales in this District.

5. This action arises under the patent laws of the United States of America, 35 U.S.C. § 1, et seq. This Court has federal question jurisdiction under 28 U.S.C. § 1331 and 28 U.S.C. § 1338(a) because this is a civil action arising under the patent laws of the United States.

6. Venue is proper in this District under 28 U.S.C. §§ 1391(b) and 1400(b) because Illumina is subject to personal jurisdiction in this District, CGI has suffered and continues to suffer harm in this District, and it is a convenient forum for resolution of the Parties’ dispute set forth in these Counterclaims.

FACTUAL BACKGROUND

THE '984 PATENT

7. On April 17, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,944,984 (hereinafter the "'984 Patent'"), titled "Methods and Compositions for Efficient Base Calling in Sequencing Reactions." The named inventors of the '984 Patent are Radoje Drmanac, Matthew J. Callow, Snezana Drmanac, Brian K. Hauser, and George Yeung. The '984 Patent is attached hereto as Ex. AA (U.S. Patent No. 9,944,984).

8. By assignment, CGI obtained the entire right, title, and interest to and in the '984 Patent.

INFRINGEMENT OF THE '984 PATENT

A. Direct Infringement of the '984 Patent

9. Illumina sells DNA sequencing systems that it describes as "advanced systems featuring patterned flow cell technology." As shown below, these systems include at least the NovaSeq 6000 system, the HiSeq X Ten system, the HiSeq 3000 system and the HiSeq 4000 system.

Advanced Systems Featuring Patterned Flow Cell Technology

Patterned flow cell technology, pioneered on the HiSeq X Ten System, makes data-intensive applications more cost-effective, including the \$1000 human genome. The HiSeq 3000/HiSeq 4000 Systems were the first Illumina sequencers to use patterned flow cells for diverse genomic applications.

The NovaSeq 6000 System unites the latest high-performance imaging with the next generation of Illumina patterned flow cell technology. The updated NovaSeq flow cell design further reduces the spacing between nanowells, significantly increasing cluster density and data output.

See Ex. BB (Patterned Flow Cells, <https://www.illumina.com/science/technology/next-generation-sequencing/sequencing-technology/patterned-flow-cells.html>). Illumina also sells "Reagent Kits" to be used with the NovaSeq 6000 system, the HiSeq X Ten system, the HiSeq 3000 system, and the HiSeq 4000 system. Each of the Reagent Kits sold for use with these systems includes patterned flow cells for use during sequencing.

10. For example, Illumina sells the following reagent kits for use with the NovaSeq 6000 system: the NovaSeq S1 Reagent Kit, the NovaSeq S2 Reagent Kit, the NovaSeq S4 Reagent

Kit, and the NovaSeq SP Reagent Kit (hereinafter “NovaSeq Reagent Kits”). Ex. CC (Reagent Kits for NovaSeq 6000). Each of these NovaSeq Reagent Kits contains a unique flow cell specifically designed for use with the NovaSeq 6000, known respectively as the S1, S2, S4, and SP flow cells (hereinafter “NovaSeq Flow Cells”). *Id.* Each of these NovaSeq Flow Cells are patterned flow cells that, when used as intended, generate arrays that infringe at least claims 1-3 and 5 of the ’984 Patent.

11. In addition, the following reagent kits are designed for use with the HiSeq 3000 and HiSeq 4000 systems: the HiSeq 3000/4000 PE Cluster Kit, the HiSeq 3000/4000 SR Cluster Kit, and the HiSeq 3000/4000 SBS Kit (hereinafter “HiSeq 3000/4000 Kits”). Ex. DD (HiSeq 3000/4000 Reagent Kits, <https://www.illumina.com/products/by-type/sequencing-kits/cluster-gen-sequencing-reagents/hiseq-3000-4000-sbs-kit.html>). The HiSeq X Ten Reagent Kit v2.5 is marketed for use with the HiSeq X system. Ex. EE (HiSeq X Reagent Kits, <https://www.illumina.com/products/by-type/sequencing-kits/cluster-gen-sequencing-reagents/hiseq-x-hd-kits.html>). Each of these reagent kits comprise patterned flow cells that, when used as intended, generate arrays that infringe at least claims 1-3 and 5 of the ’984 Patent.

12. Moreover, Illumina offers a program in the United States that it calls “FastTrack Sequencing” in which Illumina will perform the sequencing of samples provided by its customers. Ex. FF (FastTrack Sequencing, <https://www.illumina.com/services/sequencing-services.html>) (“Illumina FastTrack Services provides a number of sequencing service packages, including cancer analysis and whole-genome sequencing services.”). Illumina performs its “FastTrack Sequencing” services on HiSeq X machines using TruSeq sample preparation kits. *See* Ex. GG (FastTrack Sequencing: Technology, <https://www.illumina.com/services/sequencing-services/technology.html>); Ex. HH (Technical Support Note Fast Track Sequencing, https://www.illumina.com/content/dam/illumina-marketing/documents/services/FastTrackServices_Methods_Tech_Note.pdf) (“Illumina FastTrack Human Whole-Genome Sequencing (WGS) Service is powered by the HiSeq X™ System[.]”). FastTrack Sequencing also uses HiSeq X reagent kits. *Id.* (“Sequencing runs are performed based on the *HiSeq X System Guide*, using HiSeq X reagent kits.”). The HiSeq X System Guide indicates

that the HiSeq X system uses patterned flow cells. Ex. II (HiSeq X System Guide, https://support.illumina.com/content/dam/illumina-support/documents/documentation/system_documentation/hiseqx/hiseq-x-system-guide-15050091-07.pdf) at 7 (“The HiSeq X uses a patterned flow cell with billions of ordered nanowells[.] . . . The patterned flow cell is provided in the HiSeq X Reagent Kit v2.5.”). Thus, Illumina directly infringes claims 1-3 and 5 of the ’984 Patent when performing sequencing services as part of their “FastTrack Sequencing” services.

1. Infringement Analysis for Claims 1-3 and 5 of the ’984 Patent

a. Infringement of Claim 1 of the ’984 Patent

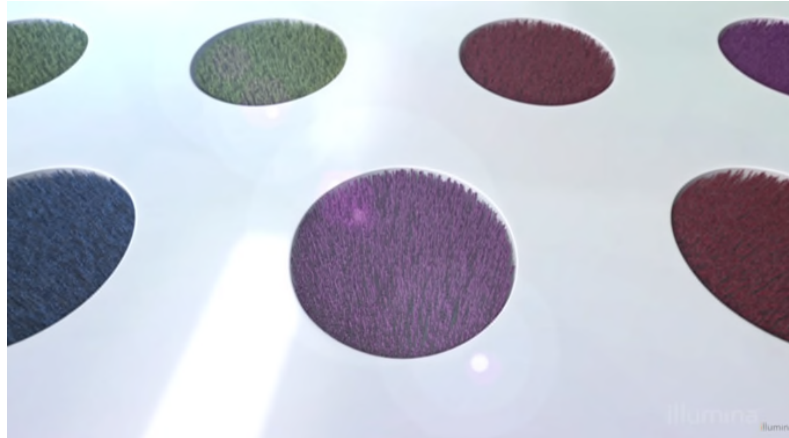
13. Claim 1 of the ’984 Patent recites:

A high density DNA array comprising
a patterned surface, said surface comprising a pattern of DNA
binding regions separated by a non-DNA binding surface, and
more than 10^5 different DNAs comprising genomic sequences bound
on the array at the DNA binding regions
wherein the DNA binding regions comprise oligonucleotides for
binding the DNAs within the DNA binding regions and all of the
DNA binding regions of the array comprise the same
oligonucleotides, and
wherein:
the density of the DNA binding regions on the array is more than
100,000 per mm^2 ,
more than 50% of the DNA binding regions in the array have
multiple copies of one single DNA of said more than 10^5 different
DNAs,
the sequence of the single DNA at each DNA binding region is not
known, and
the array is not a bead array.

14. As discussed above, the normal and intended use of the NovaSeq 6000, the HiSeqX, and the HiSeq 3000/4000 systems with their respective reagent kits infringes the ’984 Patent. The following is a detailed exemplary analysis of how the ’984 Patent is infringed during the normal and intended use of the NovaSeq 6000 with the NovaSeq Reagent Kits. In addition, the normal and intended use of the HiSeq X and HiSeq 3000/4000 systems with their respective reagent kits also infringes the ’984 Patent.

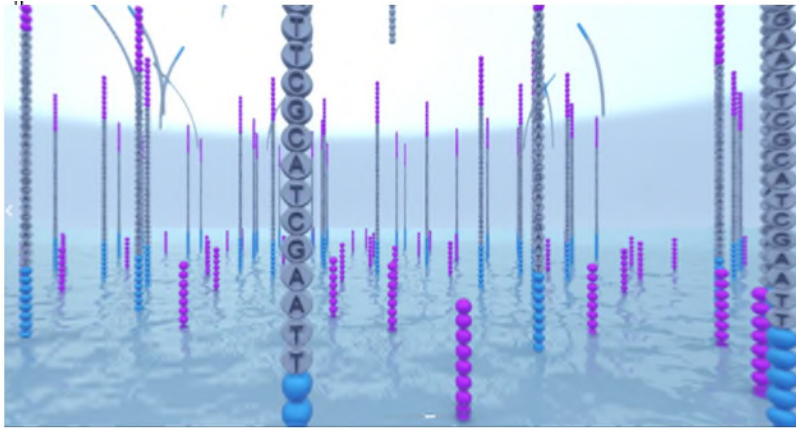
a. **“A high density DNA array comprising”**

15. On information and belief, during the intended use of the NovaSeq 6000 Sequencing System with the NovaSeq Reagent Kits, a high density DNA array is generated. On information and belief, the intended use of the NovaSeq 6000 Sequencing System with the NovaSeq Reagent Kits results in a plurality of clusters of DNA immobilized on the surface of the array (either directly bound to the substrate of the flow cell or indirectly bound to the substrate of the flow cell (*e.g.*, via a polymer coating on the substrate)). Each DNA cluster comprises a plurality of identical copies of oligonucleotides. These DNA clusters are spatially localized within nanowells on the flow cell surface. On information and belief, the Patterned Flow Cell Technology video depicts a patterned flow cell having a plurality of different DNA clusters directly or indirectly bound to the surface of a flow cell, with each cluster localized within a nanowell:



Ex. JJ (Patterned Flow Cell Video <https://www.illumina.com/company/video-hub/pfZp5Vgsbw0.html>) at 1:23-1:31. On information and belief, for most, if not all, of the DNA clusters, each cluster comprises at least a dominant plurality of identical nucleic acids,⁵ directly or indirectly bound to the surface of the flow cell. This is depicted in the “NovaSeq System Explorer” video, as shown below.

⁵ On information and belief, many of the clusters in Illumina’s patterned flow cells comprise only one set identical nucleic acids having a genomic sequence. However, due to several factors (*e.g.*, PCR error during bridge amplification and/or introduction of a second genomic strand during bridge amplification), some clusters may comprise two or more sets of nucleic acids having genomic sequences, with one dominant population from which the sequence is deduced. Even in this case, such clusters comprise a plurality of identical nucleic acids, as required by claim 1.



Ex. KK (NovaSeq System Explorer Video, <https://www.illumina.com/systems/sequencing-platforms/novaseq/system-explorer.html>). The excerpt above depicts a single nanowell on a NovaSeq flow cell during the intended operation of a NovaSeq 6000 sequencer. The excerpt above depicts the nanowell as having a plurality of identical DNA strands directly or indirectly bound to the array of the flow cell. This plurality of identical, immobilized nucleic acids comprises one “DNA cluster.” The Illumina “Introduction to Next-Generation Sequencing Technology” provides the following definition for “cluster”:

A clonal grouping of template DNA bound to the surface of a flow cell. ***Each cluster is seeded by a single template DNA strand*** and is clonally amplified through bridge amplification until the cluster has ~1000 copies. Each cluster on the flow cell produces a single sequencing read.

Ex. LL (Introduction to Next Generation Sequencing, https://www.illumina.com/documents/products/illumina_sequencing_introduction.pdf) at 14.

16. Furthermore, the NovaSeq Sequencing System brochure describes the flow cells compatible with the NovaSeq system in the following manner:

The redesigned NovaSeq flow cells improve upon patterned flow cells first deployed on the HiSeq X System. Each flow cell contains billions of nanowells at fixed locations for even cluster spacing and uniform feature size. ***NovaSeq flow cells reduce spacing between nanowells, significantly increasing cluster density.*** Combining the higher cluster density with proprietary exclusion amplification clustering maximizes the number of nanowells occupied by DNA

clusters originating from a single DNA template for a substantial increase in data output.

Ex. MM (NovaSeq™ 6000 Sequencing System, <https://www.illumina.com/content/dam/illumina-marketing/documents/products/datasheets/novaseq-6000-system-specification-sheet-770-2016-025.pdf>) at 3. Thus, on information and belief, the intended use of the NovaSeq 6000 with the NovaSeq Flow Cells found in the NovaSeq Reagent Kits leads to the formation of a high-density DNA array.

17. Similarly, the intended use of the HiSeq X and HiSeq 3000/4000 systems with their respective reagents kits leads to the formation of a high-density DNA array.

b. **“a patterned surface, said surface comprising a pattern of DNA binding regions separated by a non-DNA binding surface, and”**

18. On information and belief, the high-density DNA array generated by the intended use to the NovaSeq 6000 comprises a patterned surface, with the patterned surface comprising a pattern of DNA binding regions separated by a non-DNA binding surface. The NovaSeq System Guide reinforces this understanding of the structure and functionality of the NovaSeq Flow Cells:

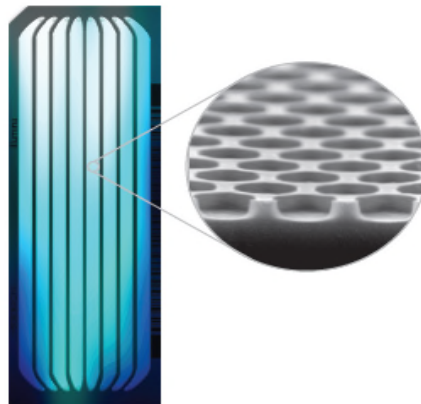
The NovaSeq 6000 flow cell is a patterned flow cell encased in a cartridge. *The flow cell is a glass-based substrate containing billions of nanowells in an ordered arrangement*, which increases the number of output reads and sequencing data. *Clusters are generated in the nanowells* from which sequencing is then performed.

Each flow cell has multiple lanes for sequencing pooled libraries. The SP, S1, and S2 flow cells have two lanes each, and the S4 flow cell has four. Each lane is imaged in multiple swaths, and the software then divides the image of each swath into smaller portions called tiles.

Ex. NN (NovaSeq 6000 System Guide, http://jp.support.illumina.com/content/dam/illumina-support/documents/documentation/systemex_documentation/novaseq/novaseq-6000-system-guide-1000000019358-09.pdf) at 12. Thus, on information and belief, each of the SP, S1, S2, and S4 flow cells comprise a patterned surface having DNA binding regions (*i.e.*, nanowells in which

clusters are generated) arranged in an ordered manner and separated by a non-DNA-binding region of the flow cell surface (*i.e.*, the regions between nano-wells).

19. The “Technology Spotlight: Patterned Flow Cell Technology” brochure, also available on Illumina’s website provides an informative diagram that depicts the surface of a patterned flow cell:



Ex. OO (Tech Spotlight: Patterned Flow Cell Technology,

<https://www.illumina.com/content/dam/illumina-marketing/documents/products/technotes/patterned-flow-cell-technology-technical-note-770-2015-010.pdf>) at 1. The right side of the image

depicts the surface found in the lanes of patterned flow cells, such as the NovaSeq Flow Cells.

This diagram shows the nanowell regions in the flow cell surface, as well as the interstitial region of the flow cell surface surrounding each nanowell. This brochure states that “[p]atterned flow cells contain billions of nanowells at fixed locations, providing even cluster spacing and uniform feature size to deliver extremely high cluster densities.” *Id.* Thus, the surface of each of the NovaSeq Flow Cells comprises an ordered arrangement of nanowells, where DNA can bind. Further, the surface of each of the NovaSeq Flow Cells comprises regions that separates each nanowell where DNA cannot bind.

20. The brochure emphasizes several problems with traditional (*i.e.*, non-patterned) flow cells and explains how the patterned flow cells overcome these problems:

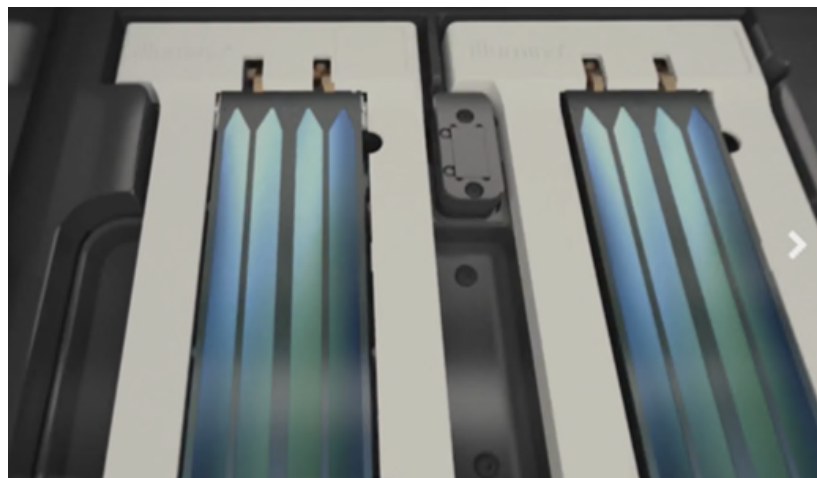
Patterned flow cell technology overcomes these challenges with prearranged nanowells that optimize cluster spacing. ***Clusters can only form in the nanowells***, making the flow cells less susceptible to overloading. ***New patented chemistry allows simultaneous seeding and amplification during cluster generation to minimize the chances of multiple library fragments amplifying as a single cluster.***

Ex. OO at 1. The brochure also explains Illumina's method of producing the patterned surface and how this method of production results in DNA-binding regions exclusively located within the nanowells:

Patterned flow cells are produced using semiconductor manufacturing technology. Starting with a glass substrate, patterned nanowells are etched into the surface. ***Each nanowell contains DNA probes used to capture prepared DNA strands for amplification during cluster generation. The area between the nanowells is devoid of DNA probes, preventing the formation of clusters in the interstitial regions between wells.*** This process ensures that DNA clusters only form within the nanowells, providing even, consistent spacing between adjacent clusters and allowing accurate resolution of clusters during imaging. The result is maximal use of the flow cell surface leading to overall higher clustering.

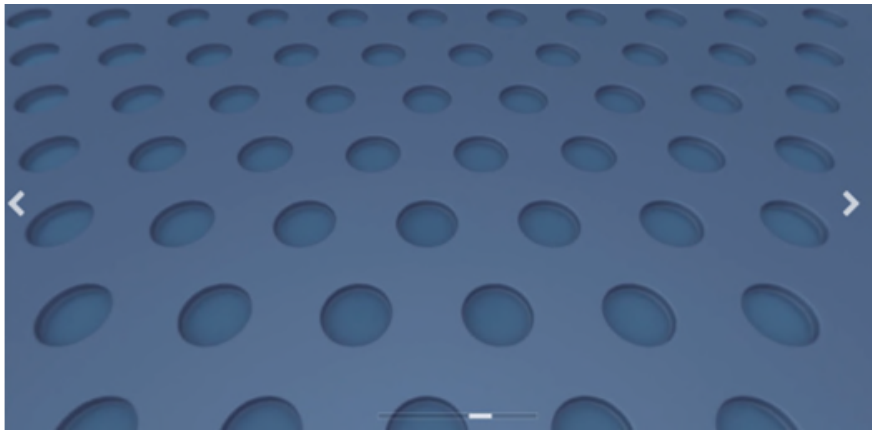
Id. On information and belief, the normal and intended use of the NovaSeq sequencer with the NovaSeq Flow Cells does not result in immobilized nucleic acids in the area of the flow cells surrounding the nanowells.

21. Illumina's NovaSeq System Explorer video depicts a NovaSeq Flow Cell within a NovaSeq 6000 sequencer.



Ex. KK; *see also* Ex. PP (NovaSeq VR video, <https://www.illumina.com/company/video-hub/68oY5APcfJM.html>) at 1:27.

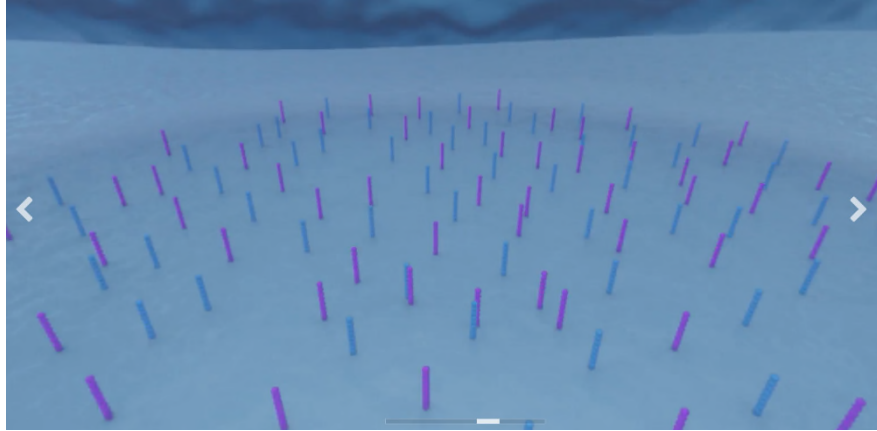
22. The excerpt from the video depicts the NovaSeq S4 flow cell, which uniquely comprises four lanes on each flow cell. The video depicts the surface of the flow cell, which is a patterned surface, as shown below:



Ex. KK; *see also* Ex. PP at 1:30-1:33.

23. The surface of the flow cell depicted in the “NovaSeq System Explorer Video” comprises a plurality of nanowells, indicated by the dark recesses in the flow cell surface. On information and belief, the flow cell comprises a glass-based substrate containing billions of nanowells in an ordered arrangement.

24. On information and belief, oligonucleotides are found within each nanowell of a NovaSeq Flow Cell. These oligonucleotides are directly or indirectly bound to the surface of the flow cell. This is depicted in the NovaSeq System Explorer video, which shows a plurality of oligonucleotides within a nanowell.



Ex. KK; *see also* Ex. PP at 1:33-1:35.

25. These oligonucleotides are necessary for binding sample DNA and generating DNA clusters. These oligonucleotides are not found in the interstitial region of the flow cell surface that separate the nanowells (*i.e.*, the regions between nano-wells). Thus, the NovaSeq Flow Cells comprise DNA-binding regions (*i.e.*, the nanowells) separated by a non-DNA binding surface (*i.e.*, the interstitial region of the flow cell surface). Ex. KK; *see also* Ex. PP.

26. For the same reasons, the patterned flow cells in the HiSeq X Reagent Kit v2.5 and the HiSeq 3000/4000 Reagent Kits also comprise DNA binding regions separated by a non-DNA binding surface.

c. **“more than 10⁵ different DNAs comprising genomic sequences bound on the array at the DNA binding regions”**

27. As discussed above, during the intended use of the NovaSeq 6000 with any of the NovaSeq Reagent Kits, NovaSeq Flow Cells comprise a DNA array.

28. The NovaSeq Flow Cells comprise billions of nanowells. For example, the NovaSeq System Guide states that “[t]he flow cell is a glass-based substrate containing **billions of nanowells** in an ordered arrangement” and that “clusters are generated in the nanowells[.]” Ex. NN at 12 (emphasis added). Illumina’s Technology Spotlight: Patterned Flow Cell Technology similarly states that “[p]atterned flow cells contain **billions of nanowells** at fixed locations, providing even cluster spacing[.]” Ex. OO at 1.

29. A vast majority of the clusters comprise a plurality of DNA molecules comprising a single genomic sequence (either as a homogenous population or a dominant population). For

example, in the “NovaSeq™ 6000 Sequencing System” brochure, Illumina advertises “proprietary exclusion amplification clustering [that] *maximizes the number of nanowells occupied by DNA clusters originating from a single DNA template* for a substantial increase in data output.” Ex. MM at 3. Illumina claims that “new patented chemistry allows simultaneous seeding and amplification during cluster generation [and] *minimize[s] the chances of multiple library fragments amplifying as a single cluster.*” Ex. OO at 1.

30. The NovaSeq 6000 System Specification brochure provides the sequencing output per flow cell for each of the NovaSeq Flow Cells in Table 1:

Table 1: NovaSeq 6000 System flow cell specifications

Flow cell type	SP	S1	S2	S4
Lanes per flow cell	2	2	2	4
Output per flow cell ^{a,b}				
2 × 50 bp	65-80 Gb	134-167 Gb	333-417 Gb	N/A
2 × 100 bp	N/A	266-333 Gb	667-833 Gb	1600-2000 Gb
2 × 150 bp	200-250 Gb	400-500 Gb	1000-1250 Gb	2400-3000 Gb
2 × 250 bp	325-400 Gb	N/A	N/A	N/A
Single reads CPF	0.65-0.8 B	1.3-1.6 B	3.3-4.1 B	8-10 B
Paired-end reads CPF	1.3-1.6 B	2.6-3.2 B	6.6-8.2 B	16-20 B

a. Output and read number specifications based on a single flow cell using Illumina PhiX control library at supported cluster densities. The NovaSeq 6000 System can run one or two flow cells simultaneously.

b. N/A = not applicable, CPF = clusters passing filter.

Ex. MM at 2. Table 1 (above) provides that the SP flow cell, operated at supported cluster densities, generates 0.65-0.8 billion single reads from clusters passing filter. *Id.* As shown in Table 1, the number of “single reads” is doubled (1.3-1.6 billion) for paired-end reads because each cluster produces two single reads (*i.e.*, a forward read and a reverse-complement read) for each cluster during paired-end reading. As each SP flow cell has two lanes, the total number of clusters passing filter on each lane is approximately 325-400 million. The NovaSeq System Guide indicates that clusters are generated on only one surface of each flow cell lane. Ex. NN at 66.

31. As described above, each single fragment of target nucleic acid generates at most a single cluster and each cluster typically comprises one sequence from the sample nucleic acid. Nanowells that do not generate clusters will not produce a signal that passes the NovaSeq filter. Therefore, during the normal and intended use of the NovaSeq SP flow cell with the NovaSeq 6000 system, each lane of the flow cell comprises a surface with an array comprising more than 100,000 (10^5) DNAs having genomic sequences (*i.e.*, clusters). The entire glass flow cell likewise comprises a surface with an array comprising more than 100,000 (10^5) DNAs having genomic sequences, because each NovaSeq flow cell comprises more than one flow cell lane.

32. The normal and intended use of the other NovaSeq Flow Cells (*i.e.*, the S1, S2, and S4 flow cells) similarly generates arrays comprising more than 10^5 DNAs having genomic sequences. The table above demonstrates that each lane of these other NovaSeq Flow Cells has between 650 million clusters (S1 flow cell having 2 lanes) to 2.5 billion clusters (S4 flow cell having 4 lanes) at supported library densities. Ex MM at 2. During the use of each of these flow cells, clusters are generated on two surfaces of each flow cell lane (*i.e.*, the top and bottom surfaces). Thus, the use of these NovaSeq Flow Cells results in DNA arrays having between 325 million and 1.25 billion clusters per surface of each flow cell lane.

33. Thus, in light of the foregoing, on information and belief, during the normal and intended use of the NovaSeq 6000 with any of the NovaSeq Reagent Kits, NovaSeq Flow Cells comprise a DNA array having more than 10^5 (*i.e.*, 100,000) different DNAs comprising genomic sequences regardless of whether the array is defined as the entire flow cell or each lane of the flow cell.

34. The HiSeq 3000/4000 System Specification portion of Illumina's website also provides a table depicting the output data for the HiSeq 3000 and HiSeq 4000 systems:

Performance Parameters

	HiSeq 3000 System	HiSeq 4000 System
No. of Flow Cells per Run	1	1 or 2
Data Yield - 2 × 150 bp	650–750 Gb	1300–1500 Gb
Data Yield - 2 × 75 bp	325–375 Gb	650–750 Gb
Data Yield - 1 × 50 bp	105–125 Gb	210–250 Gb
Clusters Passing Filter (8 lanes per flow cell)	up to 2.5B single reads or 5B paired end reads	up to 5B single reads or 10B PE reads

Ex. QQ (HiSeq 3000/4000 Specifications, <https://www.illumina.com/systems/sequencing-platforms/hiseq-3000-4000/specifications.html>). During the normal and intended use of the HiSeq 3000 system, the flow cells have up to 2.5 billion clusters passing filter. According to the table above, the HiSeq 3000/4000 flow cells each have 8 lanes per flow cell. Moreover, clusters are generated on both the top and bottom surfaces of each lane. See Ex. RR (HiSeq 3000 System Guide, https://support.illumina.com/content/dam/illumina-support/documents/documentation/system_documentation/hiseq3000/hiseq-3000-system-guide-15066493-05.pdf) at 1 (“dual surface imaging”), 41 (describing data reading from the top and bottom surfaces of the flow cell). Therefore, each surface of each lane has up to approximately 156.25 million clusters passing filter.

35. During the normal and intended use of the HiSeq 4000 system, the flow cells have twice as many clusters passing filter: Each flow cell lane has up to approximately 625 million clusters passing filter. The HiSeq 4000 also generates data from clusters on both the top and bottom surface of each flow cell lane. See Ex. SS (HiSeq 4000 System Guide, https://support.illumina.com/content/dam/illumina-support/documents/documentation/system_documentation/hiseq4000/hiseq-4000-system-guide-15066496-05.pdf) at 1, 41.

36. The HiSeq X System Specification portion of Illumina’s website provides a table depicting the output data for the HiSeq X system:

HiSeq X Instrument Performance Parameters*

	Dual Flow Cell	Single Flow Cell
Output per Run	1.6-1.8 Tb	800-900 Gb
Reads Passing Filter	5.3-6 billion	2.6-3 billion

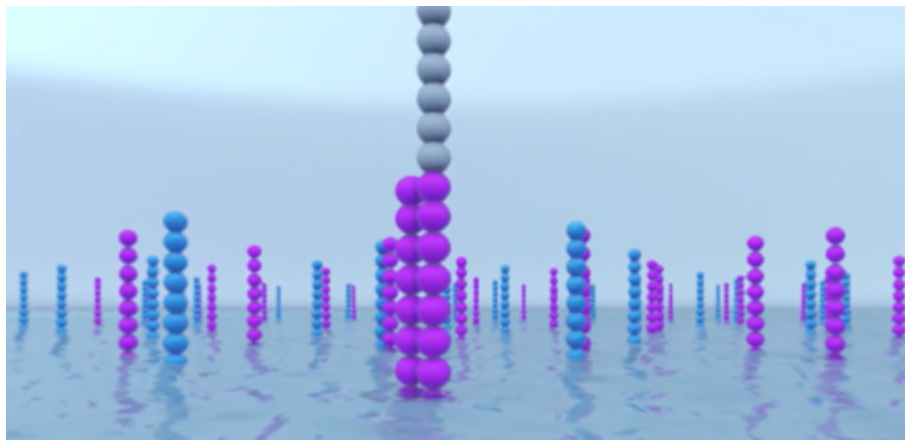
Ex. TT (HiSeq X Specifications, <https://www.illumina.com/systems/sequencing-platforms/hiseq-x/specifications.html>). According to the table above, use of a single flow cell with the HiSeq X system results in 2.5-3 billion reads (*i.e.*, clusters) passing filter. Like the HiSeq 3000/4000 flow cells, the HiSeq X flow cells have 8 lanes. Ex. UU (HiSeq X Frequently Asked Questions, https://support.illumina.com/sequencing/sequencing_instruments/hiseq-x/questions.html) (“The HiSeq X patterned flow cell contains eight lanes and has the same general dimensions as a HiSeq high-output flow cell.”). Moreover, both the top and bottom surface of each flow cell lane is used

for sequencing. *See* Ex. II at 1, 40. Therefore, each surface of each flow cell lane has approximately 156.25-187.5 million clusters passing filter.

37. As discussed, each cluster is generally derived from a single sample fragment and thus comprises one DNA sequence. Thus, on information and belief and in light of the foregoing, during the normal and intended use of the HiSeq X and HiSeq 3000/4000 systems with their respective reagent kits, the HiSeq patterned flow cells comprise DNA arrays having more than 10^5 (*i.e.*, 100,000) different DNAs comprising genomic sequences (either on a per-lane or per-flow cell basis).

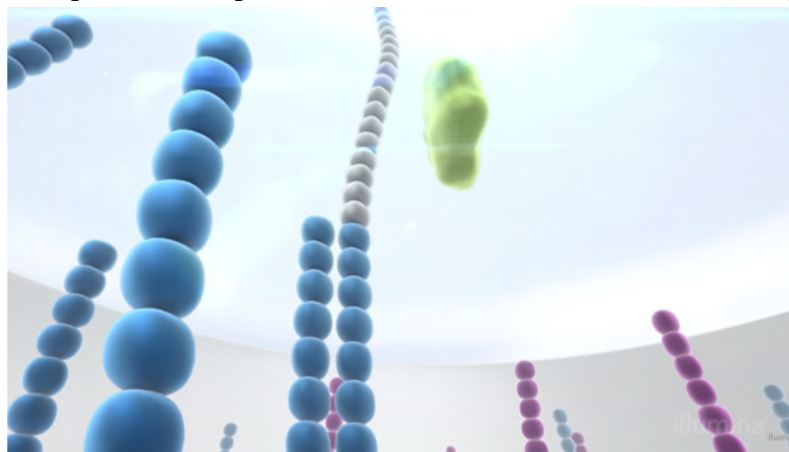
d. **“wherein the DNA binding regions comprise oligonucleotides for binding the DNAs within the DNA binding regions”**

38. During the intended use of the NovaSeq 6000 with any of the NovaSeq Reagent Kits, the DNA binding regions within the nanowells comprise oligonucleotides for binding DNA molecules. As described above, Illumina’s marketing material states that “[*e*]ach nanowell contains DNA probes used to capture prepared DNA strands for amplification during cluster generation.” Ex. OO at 1. This functionality is demonstrated in the NovaSeq System Explorer video, an excerpt of which is reproduced below:



Ex. KK; *see also* Ex. PP at 1:38. The excerpt above depicts an exemplary nanowell comprising oligonucleotides (blue and purple strands) immobilized on the array. These oligonucleotides are complementary to adapter portions on the genomic DNA (*i.e.*, purple section of purple and grey

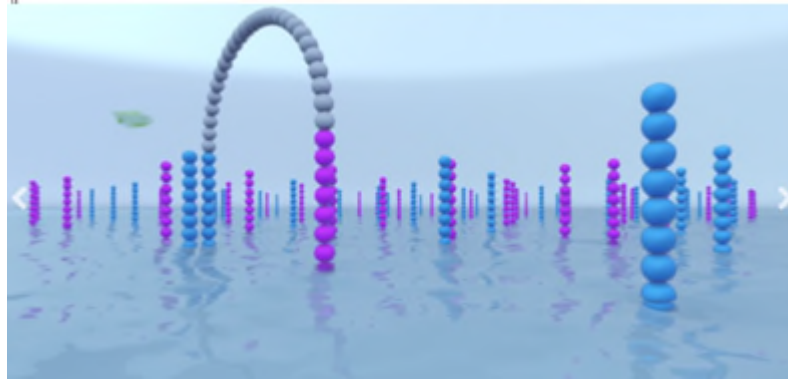
strand, center), as exemplified by the binding of one oligonucleotide to the adaptor of one genomic DNA strand. A similar process is depicted in the Patterned Flow Cell Technology video:



Ex. JJ at 0:55-1:01 (depicting an oligonucleotide (blue strand, center left) bound to a target nucleic acid fragment (blue and grey strand, center right), thereby demonstrating that the oligonucleotide binds to the DNA). Thus, the oligonucleotides in each nanowell of the NovaSeq Flow Cells comprise a sequence that is complementary to at least one of adaptors on the DNA strands that contain genomic DNA.

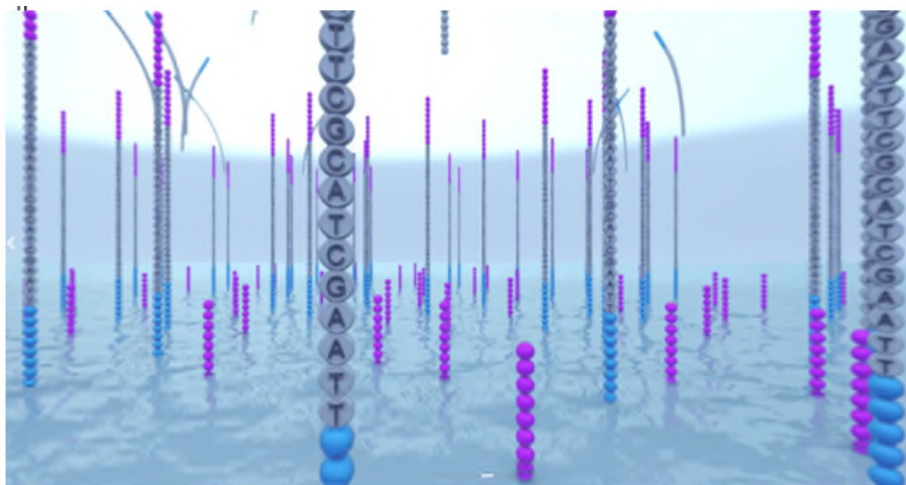
39. The normal and intended use of Illumina Library Preparation Kits, including, for example, the TruSeq™ DNA Nano and TruSeq™ DNA PCR-Free kits, results in adapters being appended to the genomic DNA fragments. *See, e.g.*, Ex. VV (TruSeq DNA Nano, https://www.illumina.com/content/dam/illumina-marketing/documents/products/datasheets/datasheet_truseq_nano_dna_sample_prep_kit.pdf) at 2; *see also* Ex. WW (Illumina Sequencing by Synthesis Video, <https://www.illumina.com/company/video-hub/fCd6B5HRaZ8.html>) at 0:31-0:46. On information and belief, one intended purpose of the immobilized oligonucleotides in the nanowells is to bind to these adaptors, which are complementary to the oligonucleotides, thereby binding to a genomic DNA fragment and sequestering it within the nanowell. As discussed above, on information and belief, there are two sets of oligonucleotides on any of the NovaSeq Flow Cells, with each set of oligonucleotides being complementary to at least one unique adaptor out of the two adaptors appended to the genomic DNA fragments.

40. Similarly, the oligonucleotides bind the DNAs via their adaptors during bridge amplification.



Ex. KK; *see also* Ex. PP at 1:43. As shown above, the DNA containing the genomic sequence folds over and the adaptor on the DNA (blue section of multi-colored strand) binds to the complementary oligonucleotide (blue, center left). This process is repeated during bridge amplification and the oligonucleotides continue to bind DNAs at each step throughout.

41. On information and belief, following sample preparation in the intended manner and prior to sequencing, at least part of each oligonucleotide for one set of oligonucleotides remains directly or indirectly attached to the surface of the flow cell, while the other set has been converted to template strands, which are also directly or indirectly attached to the surface of the flow cell. This is demonstrated in the NovaSeq System Explorer video, as shown in the excerpt below:



Ex. KK. The excerpt depicts one nanowell (*i.e.*, DNA binding region) of a NovaSeq 6000 instrument after sample preparation, and the nanowell comprises a plurality of single-stranded nucleic acid templates disposed on a surface (blue and grey strands) derived from one set of oligonucleotides. The excerpt also depicts the second set of oligonucleotides (purple strands). On information and belief, following sample preparation using the NovaSeq 6000 sequencer, the

1 NovaSeq Reagent Kits, and the Library Preparation Kits, DNA binding regions (*i.e.*, nanowells) of
 2 the flow cell comprise immobilized template strands (*i.e.*, strands comprising the DNA to be
 3 sequenced) and one of the two sets of oligonucleotide primers. Thus, on information and belief,
 4 following sample preparation using the NovaSeq 6000 sequencer, the NovaSeq Reagent Kits, and
 5 the Library Preparation Kits, the DNA binding regions comprise oligonucleotides for binding
 6 DNAs. Moreover, as a result of the amplification process, each of the immobilized template
 7 strands comprises an oligonucleotide that is covalently linked to the genomic sequence (*e.g.*, blue
 8 portion of the template strands above). Thus, these oligonucleotides, which are covalently bound
 9 to the DNA and are directly or indirectly attached to the flow cell, also constitute oligonucleotides
 10 for binding the DNA.

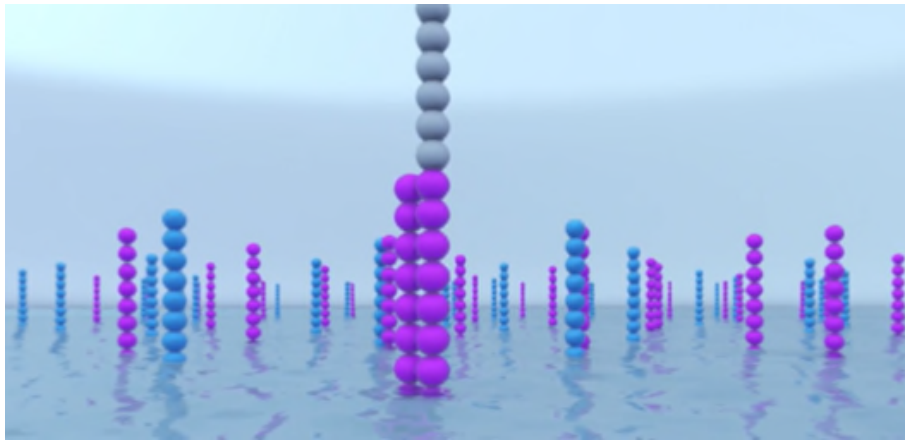
11 42. The “Patterned Flow Cell Technology” video depicts similar processes (*i.e.*,
 12 annealing to immobilized oligomers, generation of the template strand, and sequencing of the
 13 template). *See* Ex. JJ. As discussed above, Illumina’s website states that the NovaSeq 6000,
 14 HiSeq X, and HiSeq 3000/4000 systems utilize patterned flow cell technology. Ex. BB. Thus, on
 15 information and belief, for the same reasons discussed above, the DNA binding regions of the
 16 patterned flow cells in the HiSeq X and HiSeq 3000/4000 Reagent Kits comprise oligonucleotides
 17 for binding DNAs.

18 e. **“and all of the DNA binding regions of the array comprise**
 19 **the same oligonucleotides”**

20 43. On information and belief, all of the DNA binding regions of the array comprise the
 21 same two sets of immobilized oligonucleotides. On information and belief, during sample
 22 preparation with any given Illumina sample preparation kit, each fragment of target DNA is
 23 appended with a set of two adapters. On information and belief, at least a portion of each of the
 24 two adapters appended to the sample DNA fragments is complementary to one of the sets of
 25 oligonucleotides, such that at least a portion of the first adapter is complementary to one set of
 26 oligonucleotides and at least a portion of the second adapter is complementary to the other set of
 27 oligonucleotides. On information and belief, the sequences of these complementary portions are
 28 identical for each fragment of DNA appended with adapters. Because these identical sequences are

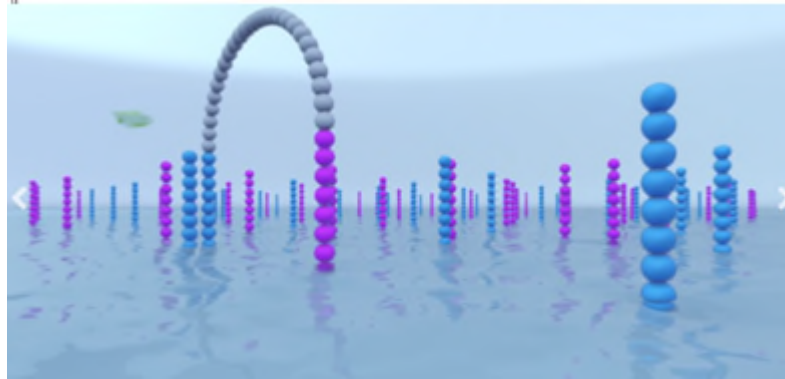
complementary to the sequences of the two sets of oligonucleotides in any given nanowell, each nanowell must use the same two sets of oligonucleotides. Therefore, on information and belief, all of the DNA binding regions of the NovaSeq Flow Cell arrays comprise the same oligonucleotides.

44. Illumina's NovaSeq System Explorer video shows the presence of the same nucleotides immobilized in each nanowell. For example, the NovaSeq System Explorer video depicts the process of cluster generation in an exemplary nanowell, in which the first step entails annealing target DNA fragment to the first set of immobilized oligonucleotides via the first of the two adaptors:



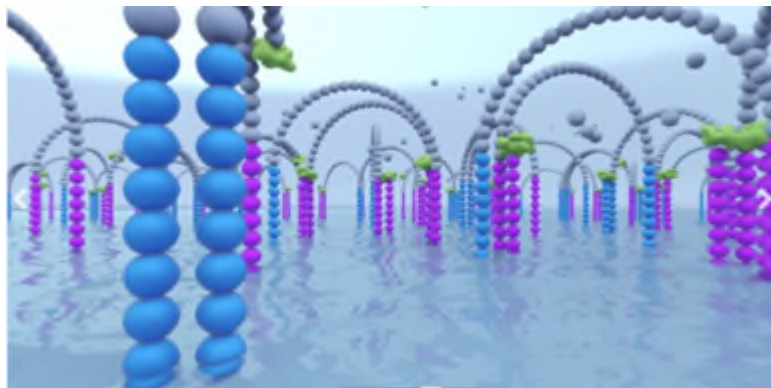
Ex. KK (depicting one of the oligonucleotides (*i.e.*, purple strand, center left) bound to a strand of DNA (*i.e.*, purple and grey thread, center right) by annealing to the adaptor portion of the DNA strand (purple portion of the thread, center right)); *see also* Ex. PP at 1:38. After strand capture, the complementary strand is generated using polymerase, thereby resulting in an immobilized template strand. On information and belief, the same process is intended to occur in any given nanowell on the NovaSeq Flow Cells.

45. The NovaSeq System Explorer video also depicts Illumina's modified "kinetic exclusion" method of bridge amplification.



Ex. KK; *see also* Ex. PP at 1:43. During this modified bridge amplification, the newly formed template strand forms a “bridge” by hybridizing (binding) to one of the second set of oligonucleotides via a portion of the second adaptor. For this process to work, at least a portion of one strand of the second adaptor must be complementary to the second set of nucleotides. Following bridge formation, the complementary strand is generated by a polymerase, resulting in a second nucleotide template strand.

46. This process is repeated many times during cluster formation.




Ex. KK; *see also* Ex. PP at 1:50-1:53. These repeated cycles of bridge amplification are only possible if all members of the first set of oligonucleotides comprise an identical sequence and all members of the second set of oligonucleotides comprise an identical sequence. As discussed above, this process is intended to occur in each of the billions of nanowells on the NovaSeq Flow Cells, with each DNA fragment having adaptors comprising identical sequences for binding to the

oligonucleotides.⁶ Therefore, on information and belief, all of the DNA binding regions of the array comprise the same two sets of oligonucleotides.

47. The “Patterned Flow Cell Technology” video depicts similar processes (*i.e.*, annealing to oligonucleotides and modified bridge amplification). *See* Ex. JJ. Thus, on information and belief, for the same reasons discussed above, all of the DNA binding regions on the patterned flow cells in the HiSeq X and HiSeq 3000/4000 Reagent Kits comprise the same two sets of oligonucleotides.

f. **“and wherein the density of the DNA binding regions on the array is more than 100,000 per mm²”**

48. On information and belief, the density of DNA binding regions on the flow cell surface is more than 100,000 per mm². As seen in the diagram below, the NovaSeq patterned flow cell has a cluster density of roughly 1,775,000-2,070,000 clusters per mm².



Flow Cell Type	HiSeq Rapid Random	HiSeq Patterned	NextSeq Random	NovaSeq Patterned
Clusters / mm ² (P.F)	700–820 K	1255–1412 K	129–165 K	1775–2070 K
Yield (Gb)	125–150	800–900	100–120	850–1000
Pitch (nm)	-	700	-	624
Feature (nm)	-	500	-	360

⁶ As discussed above, in the specially controlled kinetic exclusion process, bridge amplification occurs rapidly, thereby ensuring that a single DNA sequence makes up all or a dominant majority of the resulting template strands.

Ex. XX (Google Translation of Chinese NovaSeq Website, http://www.sohu.com/a/160407714_307557). As discussed above, during the intended use of the NovaSeq sequencer with a NovaSeq Flow Cell, only one cluster is generated per nanowell (*i.e.*, DNA binding region).

49. Additional public information provided by Illumina demonstrates that the NovaSeq Flow Cells have a higher density of nanowells than the flow cells used with the HiSeq X system, which themselves infringe the claimed density values.

The redesigned *NovaSeq flow cells improve upon patterned flow cells first deployed on the HiSeq X System*. Each flow cell contains billions of nanowells at fixed locations for even cluster spacing and uniform feature size. *NovaSeq flow cells reduce spacing between nanowells, significantly increasing cluster density*. Combining the higher cluster density with proprietary exclusion amplification clustering maximizes the number of nanowells occupied by DNA clusters originating from a single DNA template for a substantial increase in data output.

Ex. MM at 3. The Illumina specification sheet for the HiSeq X system states that cluster densities of 1,255,000 to 1,412,000 clusters per mm².

Table 2: HiSeq X System Performance Parameters^a

Parameter	Specification
Output per Run	Dual flow cell: 1.6-1.8 Tb
Single Reads Passing Filter	Dual flow cell: 5.3-6 billion
Supported Read Length	2 × 150 bp
Run Time	< 3 days
Quality	≥ 75% of bases above Q30 at 2 × 150 bp
Supported Library Preparation	TruSeq DNA PCR-Free Library Prep Kit TruSeq Nano DNA Library Prep Kit

a. Specifications based on Illumina PhiX control library at supported cluster densities (1255–1412 K clusters/mm²) on 1 HiSeq X System. Supported library preparation kit includes TruSeq Nano DNA Kit and TruSeq PCR-Free DNA Kit with 350 bp or 450 bp target insert size and HiSeq X Reagent Kit v2.5. The HiSeq X System was designed, optimized, and licensed for WGS. Other applications are not permitted.

Ex. YY (HiSeq X Specification Sheet, <https://www.illumina.com/documents/products/datasheets/datasheet-hiseq-x-ten.pdf>) at 2 (stating that the disclosed specifications were “at

supported *cluster densities (1255-1412 K clusters/mm²)* (emphasis added)). Thus, the patterned surface of the lanes of both the HiSeq X flow cells and the NovaSeq Flow Cells have a density of DNA binding regions that is more than 100,000 per mm².

g. **“more than 50% of the DNA binding regions in the array have multiple copies of one single DNA of said more than 10⁵ different DNAs”**

50. During the intended use of the NovaSeq 6000 sequencer with the NovaSeq Flow Cells for DNA sequencing, more than 50% of the DNA binding regions (*i.e.*, nanowells) have multiple copies of one single fragment of genomic DNA. As discussed above, the specially controlled bridge amplification process (*e.g.*, Illumina’s kinetic exclusion method) during cluster generation results in multiple copies of a single DNA within a nanowell. *See also* Ex. LL at 14 (stating that “[e]ach cluster is seeded by a single template DNA strand and is clonally amplified through bridge amplification until the cluster has ~1000 copies”).

51. Illumina’s NovaSeq 6000 Sequencing System brochure states that its “*clustering maximizes the number of nanowells occupied by DNA clusters originating from a single DNA template for a substantial increase in data output.*” Ex. MM at 3. Thus, on information and belief, during operation of the NovaSeq 6000, more than 50% of the DNA binding regions in the NovaSeq Flow Cell array have multiple copies of one single genomic DNA fragment resulting in a sequence read.

52. Illumina’s Patterned Flow Cell Technology video similarly shows DNA clusters formed within the nanowells on a flow cell surface. Ex. JJ at 1:26-1:34. On information and belief, during the normal and intended use of the HiSeq X and the HiSeq 3000/4000 systems, the DNA binding regions in these patterned flow cell arrays similarly have multiple copies of one single genomic fragment.

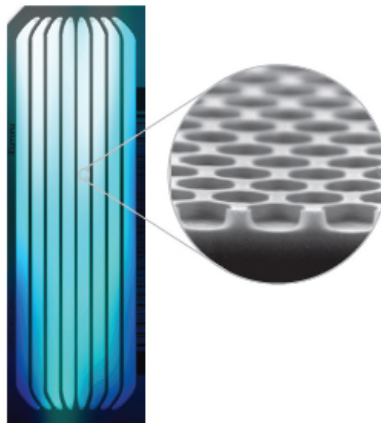
h. **“the sequence of the single DNA at each DNA binding region is not known”**

53. The sequence of the single DNA (*i.e.*, the sample fragment DNA) directly or indirectly bound to the surface of each nanowell during and/or following sample preparation is not

known. During sample preparation, the target nucleic acid is fragmented and these fragments are randomly scattered across the flow cell. Therefore, even if a sample contained known sequences prior to sample preparation, after fragmentation, flow cell loading, and cluster generation, the sequence of the DNA fragment in any particular cluster would be unknown. Moreover, the primary intended use for the NovaSeq 6000, the HiSeq X, and the HiSeq 3000/4000 is DNA sequencing (*e.g.*, whole genome sequencing, exome sequencing, etc.), which entails the use of unknown DNA samples (*e.g.*, individual human samples with their genomic variants).

i. **“and the array is not a bead array.”**

54. The NovaSeq Flow Cells do not use a bead array. The patterned flow cells used in NovaSeq Reagent Kits are uniformly depicted in Illumina marketing material as a planar, textured surface, such as that shown below:



Ex. OO at 1. The '984 Patent describes “substantially planar” arrays as different embodiments than “bead arrays.” *See* '984 at 27:10-28:67 (discussing various embodiments of arrays having “a substantially planar surface”); *cf* 32:5-57 (describing bead arrays as “another embodiment”). Thus, the arrays generated during the use of the NovaSeq 6000 system are not bead arrays.

55. For the same reasons, the arrays generated during the normal and intended use of the HiSeq X and HiSeq 3000/4000 systems are not bead arrays. For example, the Illumina website uses the same image to market reagent kits for the HiSeq X and HiSeq 3000/4000 systems. *See, e.g.*, Ex. DD; Ex. EE.

1 56. Accordingly, during the normal and intended use of the NovaSeq 6000, HiSeq X,
2 and/or HiSeq 3000/4000 systems, arrays are generated that infringe at least claim 1 of the '984
3 Patent.

4 **2. Infringement of Claim 2 of the '984 Patent**

5 57. Claim 2 recites "The DNA array of claim 1, wherein the more than 10^5 different
6 DNAs comprise human genomic sequences."

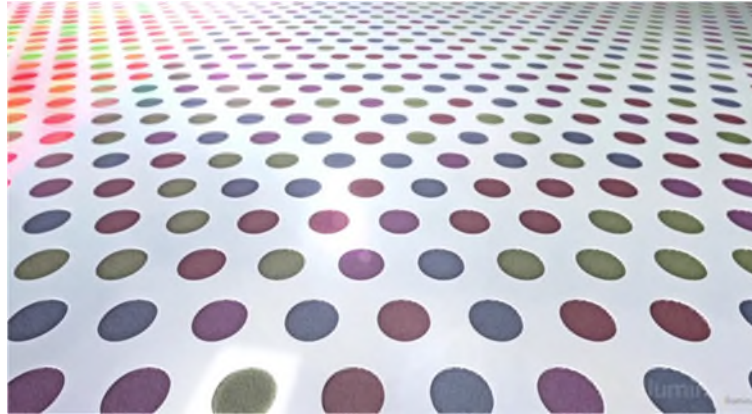
7 58. Illumina provides qualified methods for whole genome and exome sequencing,
8 including protocols for human whole-genome and human exome sequencing. *See* Ex. MM at 3
9 (Table 2 noting that "[a]n Illumina Qualified Method is available" for whole-genome sequencing
10 methods using the TruSeq™ DNA PCR-Free and Nextera DNA Flex library preparation kits).
11 After sample preparation according to one of these methods, the nucleic acid templates comprise
12 human genomic DNA sequences bound to an array (*i.e.*, directly or indirectly bound to the surface
13 of the flow cell).

14 59. For example, when the NovaSeq 6000 system is used for sequencing of human
15 DNA (such as, for example, human WGS), the more than 10^5 different nucleic acid templates that
16 are sequenced are formed from a plurality of human genomic DNA sequences, as recited in claim 2
17 of the '984 Patent.

18 **3. Infringement of Claim 3 of the '984 Patent**

19 60. Claim 3 recites "The DNA array of claim 1 wherein more than 80% of the DNA
20 binding regions in the array have multiple copies of the one single DNA."

21 61. As discussed above, the bridge amplification process results in multiple copies of a
22 single DNA within a nanowell. On information and belief, cluster formation occurs in greater than
23 80% of the nanowells on a NovaSeq Flow Cell during intended use. For example, the Illumina
24 Patterned Flow Cell Technology video depicts cluster formation in every nanowell on a patterned
25 flow cell:



Ex. JJ at 1:26-1:34. Thus, Illumina's own marketing material depicts cluster formation in more than 80% of the nanowells on a patterned flow cell.

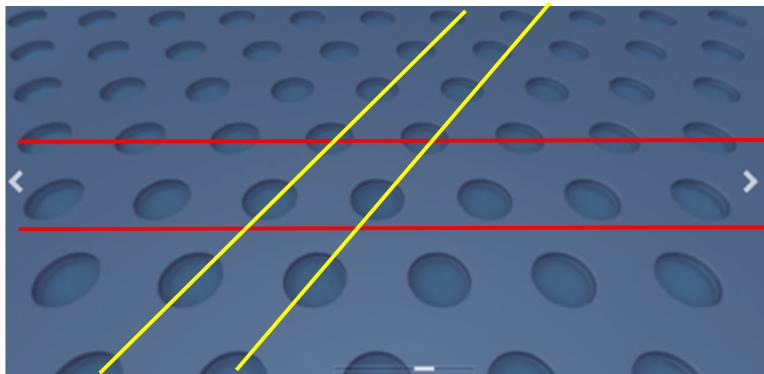
62. Furthermore, as discussed above in Paragraphs 50-52, Illumina claims to achieve extremely high numbers of clusters having at least a dominant majority of copies derived from one DNA fragment using simultaneous seeding and exclusion amplification.

63. Therefore, when the NovaSeq 6000 system is used during DNA sequencing, more than 80% of the DNA binding regions (nanowells) in the array have multiple copies of one single DNA (clusters), as recited in claim 3 of the '984 Patent.

4. Infringement of Claim 5 of the '984 Patent

64. Claim 5 recites "The DNA array of claim 1 wherein the DNA binding regions are arranged in a grid pattern."

65. The NovaSeq Flow Cells comprise a texture surface having nanowells in an ordered arrangement. For example, the NovaSeq System Explorer video depicts the surface of a flow cell:



Ex. KK (depicting the surface of a flow cell, and annotated with red and yellow lines indicating a rectilinear grid orientation of the nanowells). As seen from the foregoing excerpt, the nanowells on the NovaSeq Flow Cell surface are arranged in a rectilinear or hexagonal grid.

66. Moreover, the NovaSeq system identifies the signal coming from each nanowell by assigning positional values to each nanowell, corresponding to its position along two axes (*i.e.*, rows and columns). The NovaSeq 6000 System Guide states that cluster location files “contain[] the XY coordinates for clusters in a tile. A hexagonal layout that matches the nanowell layout of the flow cell predefines the coordinates.” Ex. NN at 71. Thus, during their intended use, the NovaSeq flow cells have DNA binding regions that are arranged in a grid pattern, as required by claim 5.

67. The HiSeq 3000/4000 and HiSeq X systems similarly use an XY coordinate grid to determine the location of each cluster on the patterned flow cell. An Illumina Informatics brochure contrasts the grid pattern of such flow cells to the clusters generated on non-patterned flow cells:

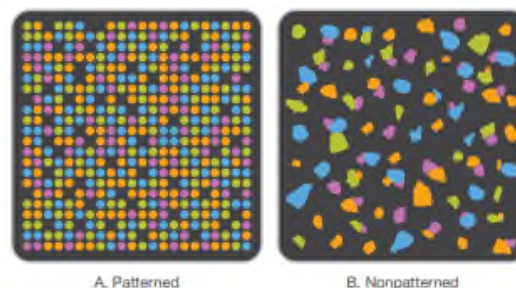


Figure 1: Patterned vs Nonpatterned Flow Cell Cluster Organization. A) Patterned flow cells have clusters with defined sizes, defined shapes, and ordered spacing. B) Nonpatterned flow cells have clusters with varied sizes, undefined shapes, and irregular spacing.

Ex. ZZ (Informatics Brochure on Clusters Passing Filter, <https://www.illumina.com/content/dam/illumina-marketing/documents/products/technotes/hiseq-x-percent-pf-technical-note-770-2014-043.pdf>). The brochure states that “[f]ive Illumina sequencing platforms currently take advantage of this advanced technology: the NovaSeq™ 6000, the NovaSeq 5000 system, the HiSeq X® System, the HiSeq® 4000 System, and the HiSeq 3000 System.” *Id.*

68. Furthermore, the System Guides for the HiSeq X and the HiSeq 3000/4000 systems describes cluster location files that contain XY coordinates on a grid. *See* Ex. II at 39 (“For each tile, 1 cluster location file contains the XY coordinates for every cluster. Cluster location files are

the result of template generation.”); *see also*, Ex. RR at 40; SS at 41. Thus, during their intended use, the HiSeq 3000/4000 and HiSeq X flow cells also have DNA binding regions that are arranged in a grid pattern, as required by claim 5.

B. Indirect Infringement of the Claims 1-3, and 5 of the '984 Patent

69. Illumina has induced and continues to induce infringement by their customers pursuant to 35 U.S.C. § 271(b). Illumina’s customers directly infringe at least claims 1-3 and 5 the '984 Patent when they use Illumina’s HiSeq X, HiSeq 3000/4000, and NovaSeq 6000 systems in combination with the recommended Illumina reagent kits, which comprise patterned flow cells. Illumina actively induces infringement by its customers by selling the HiSeq X, HiSeq 3000/4000, and NovaSeq 6000 systems, and their corresponding reagent kits and sequencing kits for use in a manner that infringes at least claims 1-3 and 5 of the '984 Patent, instructing its customers to use these products together in an infringing manner, providing qualification of the infringing methods, and by providing marketing materials, user guides, technical literature, and bioinformatics software applications to support its customers’ infringing use.

70. On information and belief, Illumina has had knowledge of the '984 Patent since at least April 17, 2018 (the issue date of the '984 Patent) or shortly thereafter. On information and belief, Illumina is a sophisticated, multinational company that regularly monitors patent issuance in related fields, and therefore became aware of the '984 Patent upon issuance or shortly thereafter. On information and belief, Illumina acted with knowledge that the induced acts constitute infringement or willful blindness with regards to its customers’ infringement of the '984 Patent. At the very least, service of this complaint provides Illumina with notice of the '984 Patent such that acts following such notice will be with knowledge that the induced acts constitute infringement.

71. In violation of 35 U.S.C. § 271(f)(1), Illumina has infringed and continues to infringe the '984 Patent by supplying all or substantially all of the components of patented invention from the United States to foreign countries. On information and belief, Illumina manufactures the accused flow cells in San Diego, California, and ships them from the United States to other countries, where such components are uncombined in whole or in part, in such manner as to actively induce the combination of such components outside of the United States in a

1 manner that would infringe the patent if such combination occurred within the United States.
2 Illumina actively encourages such combination through promotional material, manuals, sales
3 representatives, and technical support. Illumina knows that such combination constitutes
4 infringement of the '984 Patent. Illumina's conduct infringes, including at least claims 1-3 and 5
5 of the '984 Patent, literally or under the doctrine of equivalents, and violates 35 U.S.C. § 271(f)(1).

6 72. On information and belief, Illumina has contributed and continues to contribute to
7 infringement by their customers pursuant to 35 U.S.C. § 271(c). Illumina contributes to its
8 customers' direct infringement by offering to sell, selling within the United States, or importing
9 into the United States the HiSeq X, HiSeq 3000/4000, and NovaSeq 6000 sequencing systems, as
10 well as their corresponding reagent kits, which comprise patterned flow cells specially designed
11 and optimized for use in practicing claims 1-3 and 5 of the '984 Patent. Illumina sells these
12 products with the specific intent that their customers use them in a manner that infringes at least
13 claims 1-3 and 5 of the '984 Patent, and provides qualified methods and instructions directing their
14 customers to perform infringing methods.

15 73. On information and belief, at least some of these systems and related kits, such as
16 the NovaSeq Reagent Kits, the HiSeq 3000/4000 PE Cluster Kit, the HiSeq 3000/4000 Cluster Kit,
17 the HiSeq 3000/4000 SBS Kit, and the HiSeq X Ten reagent Kit v2.5, do not have a substantial
18 non-infringing use. Illumina sells these reagent kits to be exclusively compatible with one
19 sequencer series (*e.g.*, NovaSeq 6000, HiSeq 3000/4000, or HiSeq X). These highly specialized
20 products are not staple articles of commerce; they are specifically designed to be used in a manner
21 that infringes the '984 Patent. On information and belief, Illumina acted with knowledge that the
22 induced acts constitute infringement or willful blindness with regards to its customers'
23 infringement of the '984 Patent.

24 74. In violation of 35 U.S.C. § 271(f)(2), Illumina has infringed and continues to
25 infringe the '984 Patent by supplying from the United States its patterned flow cells that are
26 especially made or adapted for use in the invention of the '984 Patent, and which are not staple
27 articles or commodities of commerce. Illumina knows that these components are so made or
28 adapted and intends that these components be used so as to infringe the '984 Patent. On

information and belief, Illumina manufactures the accused flow cells in San Diego, California, and ships them from the United States to other countries. Illumina intends that these components be combined in a manner that infringes the '984 Patent, and encourages such combination through promotional material, manuals, sales representatives, and technical support. Illumina's conduct infringes one or more claims of the '984 Patent, including at least claims 1-3 and 5, literally or under the doctrine of equivalents, and violates 35 U.S.C. § 271(f)(2).

75. On information and belief, Illumina's infringement of the '984 Patent has been willful and deliberate since learning of the issuance of the '984 Patent.

CLAIMS FOR RELIEF

COUNT 1

Infringement of U.S. Patent Nos. 9,944,984

76. CGI hereby re-alleges and incorporates by reference the allegations contained in Paragraphs 1 through 75 as if fully set forth herein.

77. Illumina and its customers have directly infringed and continue to directly infringe at least claims 1-3 and 5 of the '984 Patent pursuant to 35 U.S.C. § 271(a), literally or under the doctrine of equivalents, by using the NovaSeq 6000, HiSeq 3000/4000, and/or HiSeqX sequencers with their respective reagents kits, which include high density patterned arrays. Specifically, Illumina has used the accused systems in the United States in connection with research, development, installation, testing, and qualification activities. Illumina also uses the accused systems in the United States as part of the "FastTrack Sequencing" services that Illumina offers to customers. Illumina's customers have used the accused systems with their respective reagents kits in the United States in connection with DNA sequencing activities.

78. On information and belief, Illumina has had knowledge of the '984 Patent since at least April 17, 2018 (the issue date of the '984 Patent) or shortly thereafter. On information and belief, Illumina is a sophisticated, multinational company that regularly monitors patent issuance in related fields, and therefore became aware of the '984 Patent upon issuance or shortly thereafter.

79. On information and belief, with knowledge of the '984 Patent, Illumina has and will continue to actively induce others to infringe at least claims 1-3 and 5 of the '984 Patent in

1 violation of 35 U.S.C. §271(b) by, at least, causing, instructing, urging, encouraging, and/or aiding
2 its customers to directly infringe at least claims 1-3, and 5 of the '984 Patent by using Illumina's
3 NovaSeq 6000, HiSeq 3000/4000, and/or HiSeqX sequencers with their respective reagents kits, as
4 detailed in Paragraphs 1 to 75, above.

5 80. On information and belief, Illumina has infringed and continues to infringe the '984
6 Patent by supplying all or substantially all of the components of patented invention from the United
7 States to foreign countries. On information and belief, Illumina manufactures the accused flow
8 cells in San Diego, California, and ships them from the United States to other countries, where
9 such components are uncombined in whole or in part, in such manner as to actively induce the
10 combination of such components outside of the United States in a manner that would infringe the
11 patent if such combination occurred within the United States. Illumina actively encourages such
12 combination through promotional material, manuals, sales representatives, and technical support.
13 Illumina knows that such combination constitutes infringement of the '984 Patent. Illumina's
14 conduct infringes, including at least claims 1-3 and 5 of the '984 Patent, literally or under the
15 doctrine of equivalents, and violates 35 U.S.C. § 271(f)(1).

16 81. On information and belief, Illumina acted with knowledge that the induced acts
17 constitute infringement or willful blindness with regards to its customers' infringement of the '984
18 Patent.

19 82. Illumina is liable for contributory infringement of the '984 Patent pursuant to 35
20 U.S.C. § 271(c). Specifically, Illumina has contributed to the infringement by its customers of the
21 '984 Patent by selling and offering to sell within the United States NovaSeq 6000, HiSeq
22 3000/4000, and/or HiSeqX sequencers with their respective reagents kits for use in a manner that
23 infringes the at least claims 1-3 and 5 of the '984 Patent, as described in Paragraphs 1 to 75, above.
24 The aforementioned products, which are designed, supplied and supported by Illumina, constitute a
25 material part of the claimed invention of the '984 Patent and are not a staple article or commodity
26 of commerce suitable for substantial noninfringing use.

27 83. Illumina is liable for infringement of the '984 Patent pursuant to 35 U.S.C.
28 § 271(f)(2). Specifically, Illumina has supplied in or from the United States at least patterned flow

cells that are specially made or specially adapted for use in the invention described in claims 1-3 and 5 of the '984 Patent. On information and belief, Illumina manufactures the accused flow cells in San Diego, California, and ships them from the United States to other countries. The patterned flow cells, which are designed, supplied and supported by Illumina, constitute a material part of the claimed invention of the '984 Patent and are not a staple article or commodity of commerce suitable for substantial noninfringing use. Illumina knows that these components are so made or adapted and intends that these components be combined with the accused sequencers outside the United States in a manner that infringes the '984 Patent, and encourages such combination through promotional material, manuals, sales representatives, and technical support.

84. On information and belief, Illumina's infringement of the '984 Patent has been willful and deliberate since learning of the issuance of the '984 Patent.

85. Illumina's infringement of the '984 Patent has injured CGI in its business and property rights. CGI is entitled to recovery of monetary damages for such injuries pursuant to 35 U.S.C. § 284 in an amount to be determined at trial.

86. Illumina's infringement of the '984 Patent has caused irreparable harm to CGI and will continue to cause such harm unless and until its infringing activities are enjoined by this Court.

PRAYER FOR RELIEF

A. A judgment that Illumina has directly and indirectly infringed the '984 Patent;

B. An order enjoining Illumina and its officers, directors, agents, servants, affiliates, employees, divisions, branches, subsidiaries, parents, and all others acting in active concert therewith from further infringement of the '984 Patent;

C. An award of damages pursuant to 35 U.S.C. § 284, including an award of costs, and pre- and post-judgment interest;

D. A declaration that Defendants' infringement was willful and deliberate, and an increase to the award of damages of three times the amount found or assessed by the Court, in accordance with 35 U.S.C. § 284;

E. A declaration that this case is exceptional pursuant to 35 U.S.C. § 285, and an award of attorneys' fees and costs; and

F. An award of such other and further relief as the Court may deem just and proper.

JURY DEMAND

Defendants hereby demand a trial by jury on all issues and claims so triable.

Dated: February 24, 2020

Respectfully submitted,

ARNOLD & PORTER KAYE SCHOLER LLP

By: /s/ Katie J.L. Scott

Attorneys for Defendants

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